

Reconstructing a GIS of 19th Century Urban Environmental Conditions

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Research Goals

Better Understand the Health and
Economic Conditions within 19th
Century US Cities

Requires the construction of a GIS to
integrate address-level, municipal and
federal records

Challenge

Fundamental spatial features, including the paths of streets and rivers, significantly changed within cities during the 20th century

Modern data are only useful in regions of limited change

Cincinnati – 2009 Census Tiger Shapefiles



Cincinnati – CPE Historical Reconstruction

Circa 1930



The CPE Urban GIS Project:

1. Reconstruct the historical street layout as a basemap
2. Redraw the administrative boundaries employed by agencies reporting on conditions within cities from 1830-1930
3. Collect, Digitize and Link Data
 - Census Data
 - Ward and Enumeration District-Level
 - Municipal
 - Ward, Assembly, Health and Sanitary District-Level
 - Block-Level
 - Address-Level

Historical Basemap Reconstruction Examples

Cincinnati and Chicago

Cincinnati Closeup

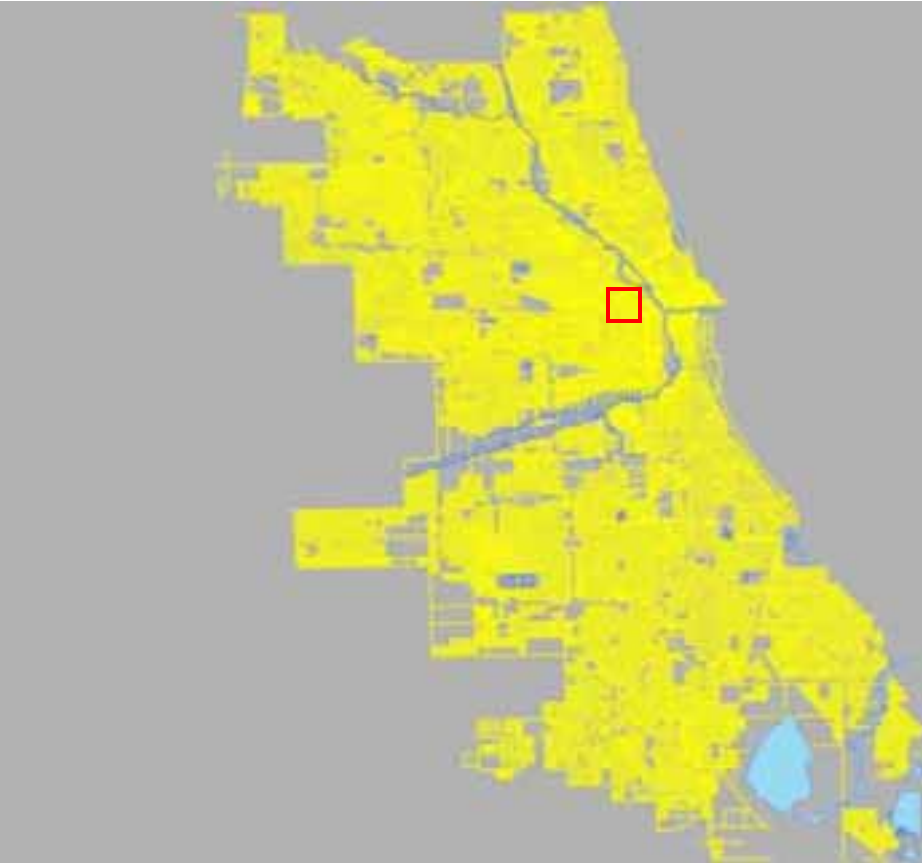


Cincinnati Closeup

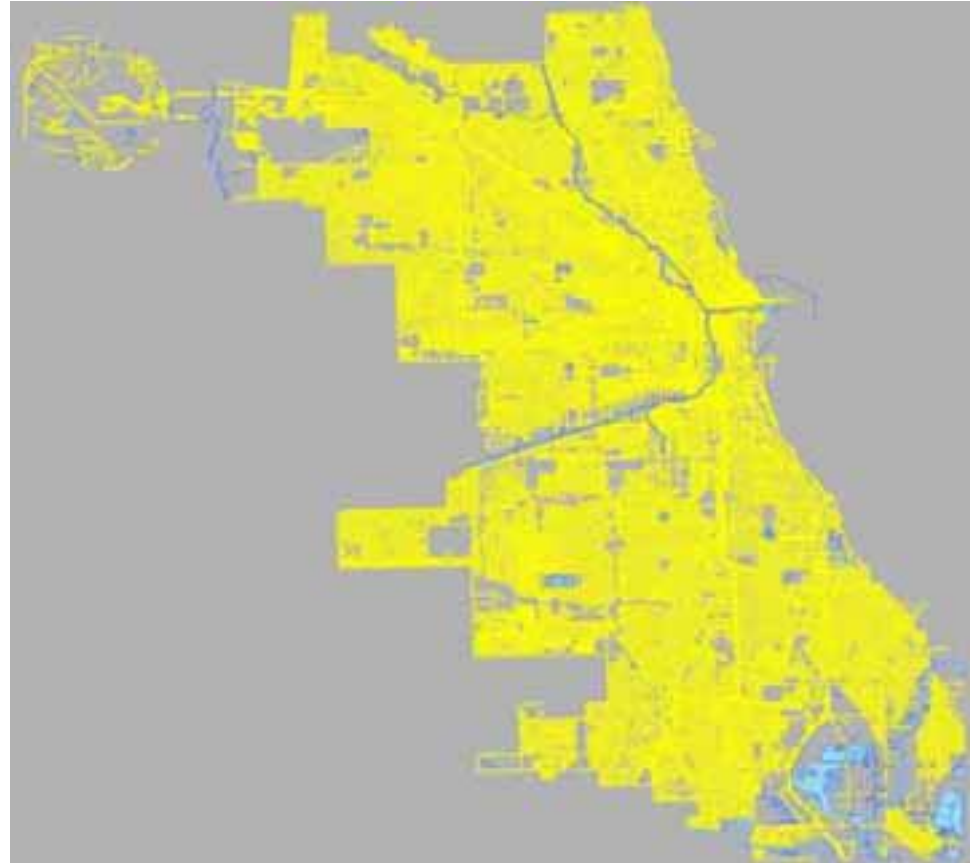


Chicago – Full Spatial Extent

1930 Chicago Extent



Current Chicago Extent



Chicago – West Town



Chicago – West Town – CPE Centerlines



Chicago – West Town with 1938 Aerial



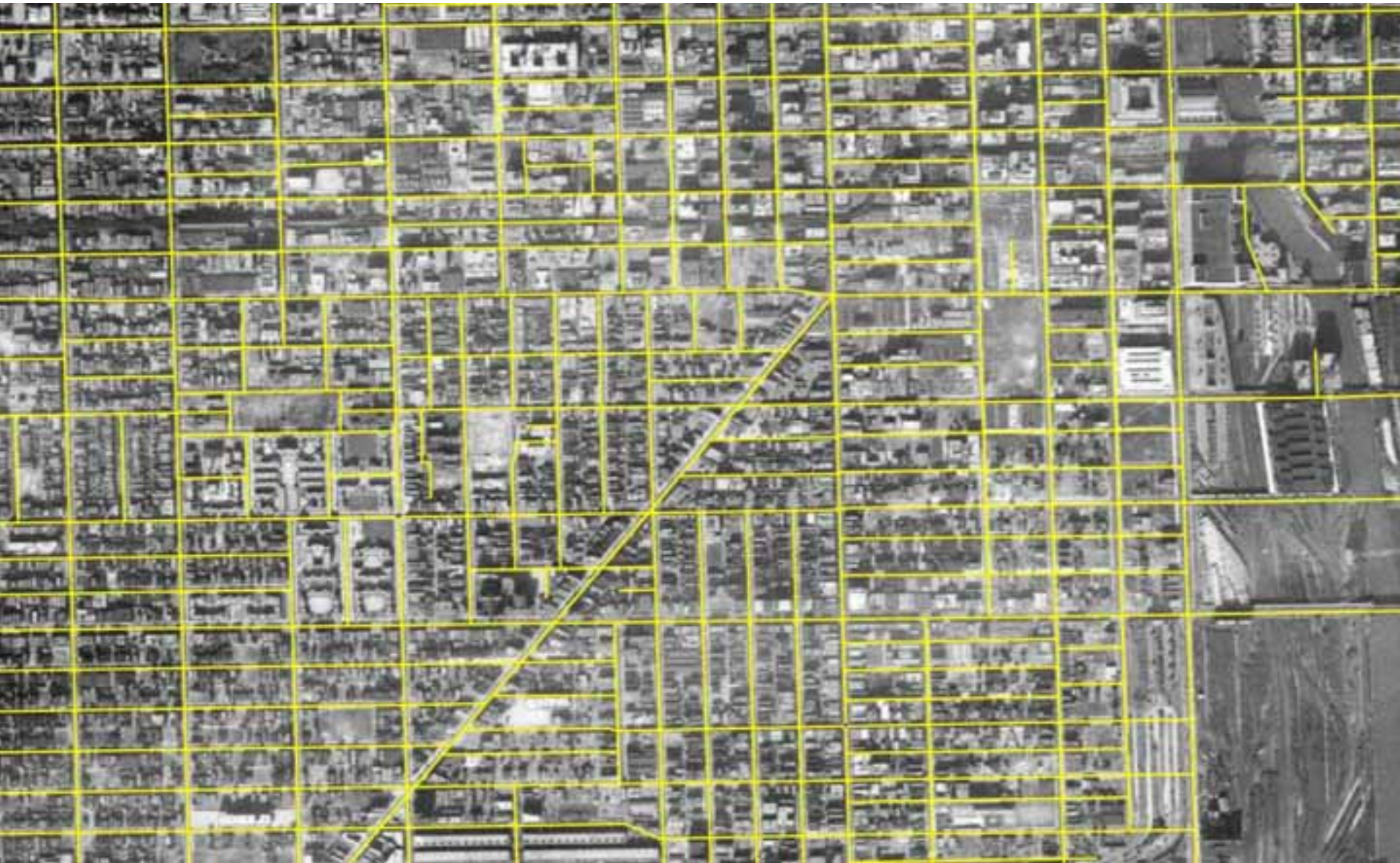
Chicago – UIC District – Historically Dense



Chicago – UIC District



Chicago – UIC District with 1938 Aerial



Reconstructing Administrative Boundaries

Ward History Example
Boston

Boston Wards 1830



Boston Wards 1835



Boston Wards 1836



Boston Wards 1838



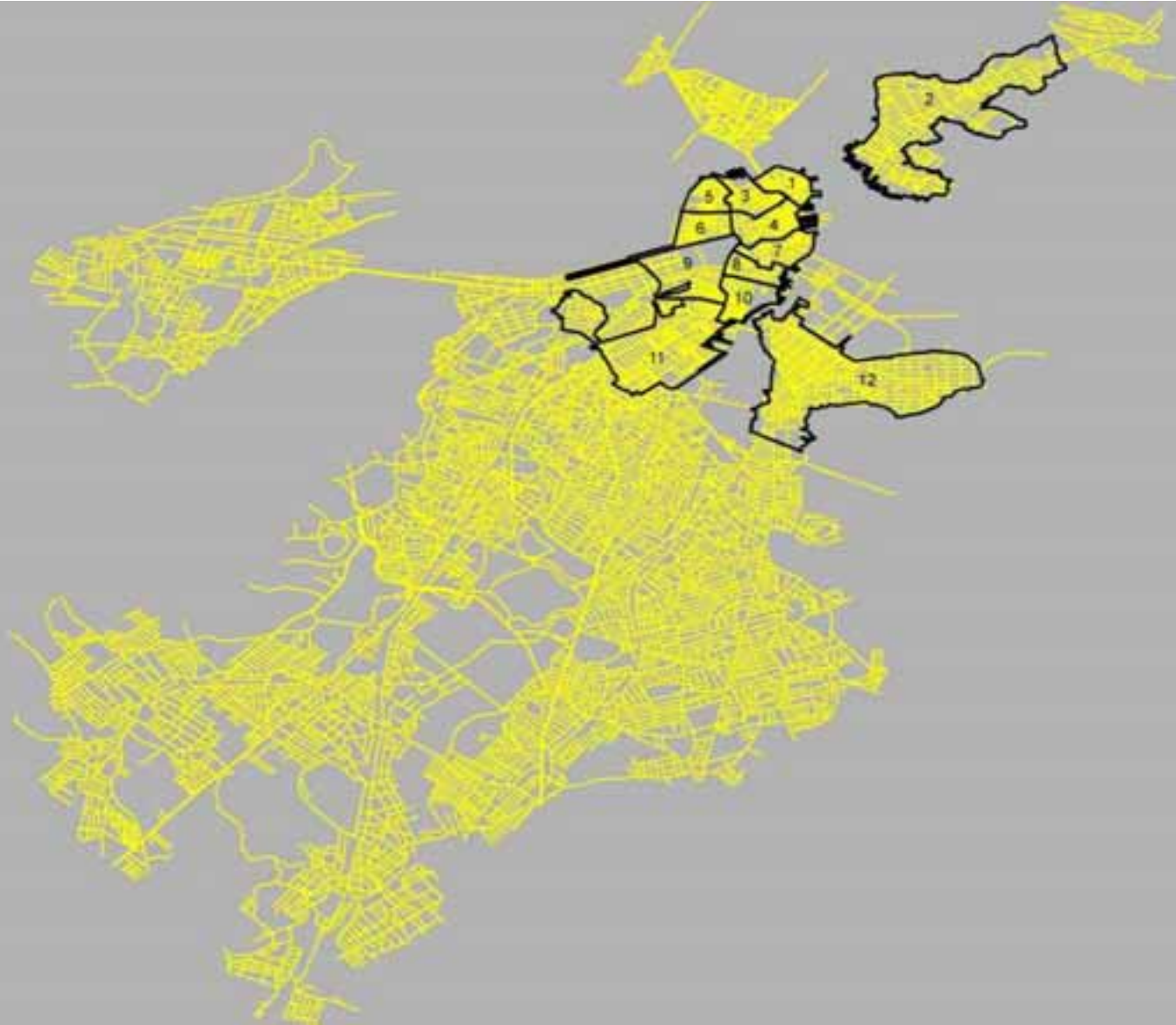
Boston Wards 1850



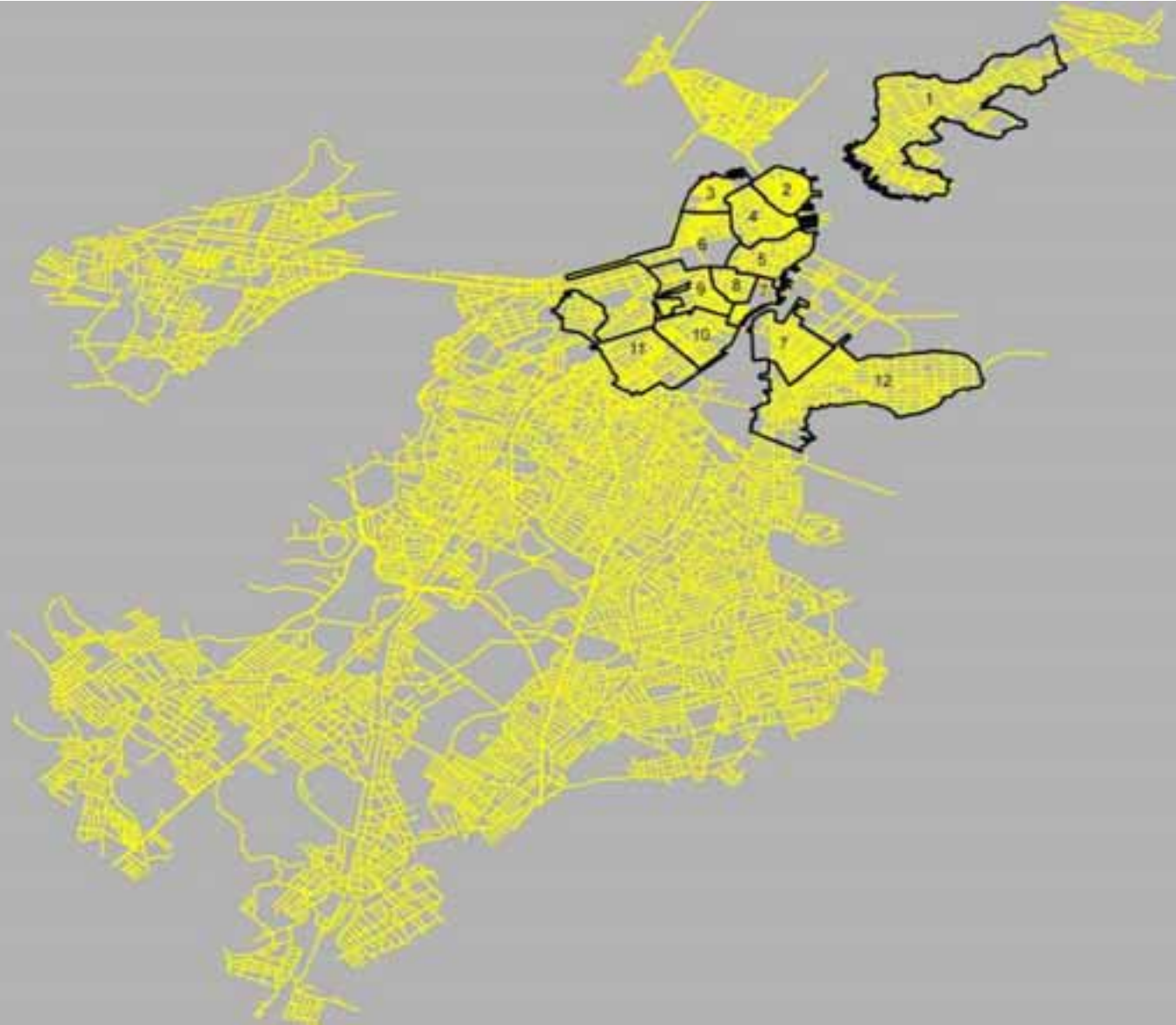
Boston Wards 1856



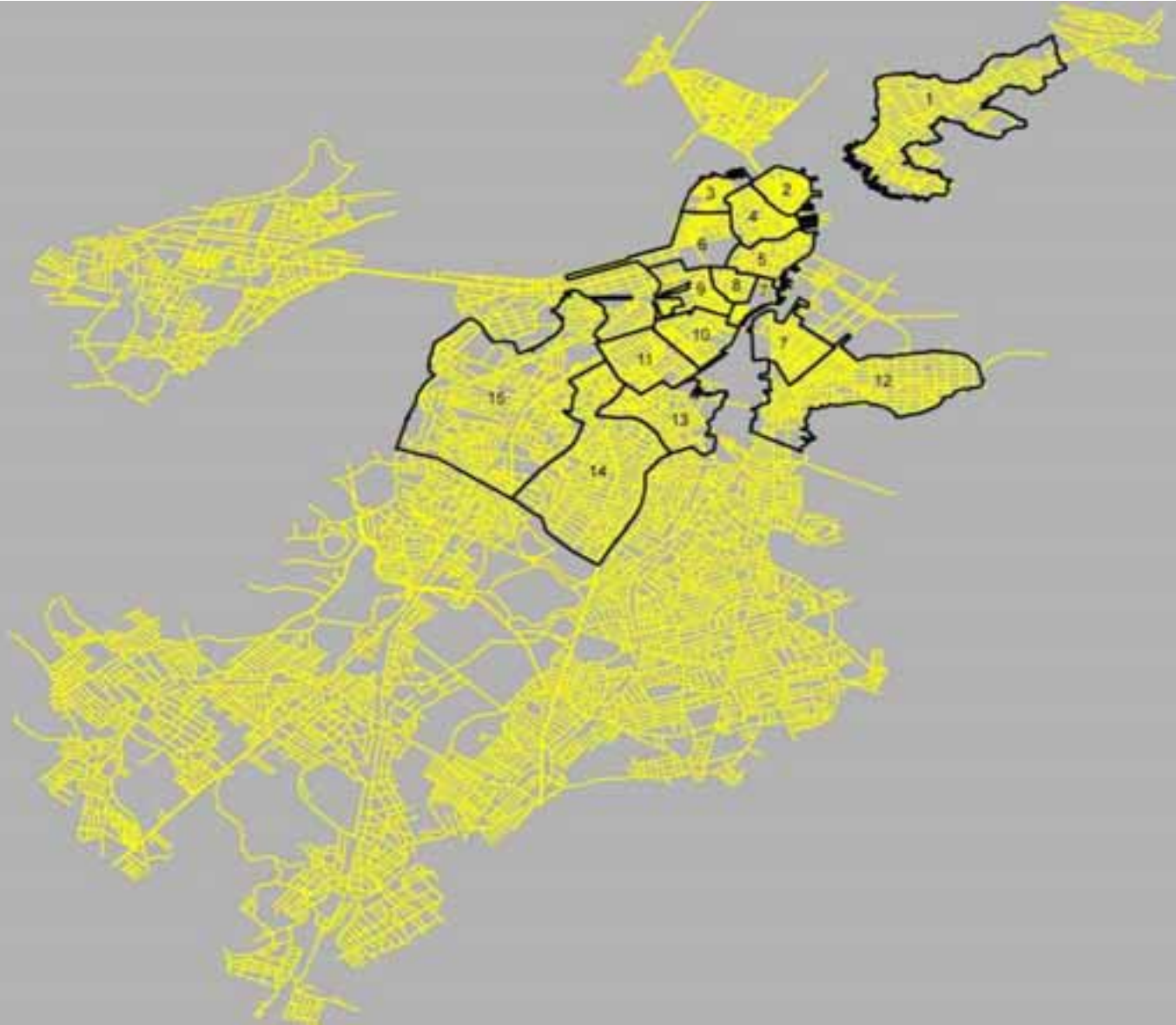
Boston Wards 1862



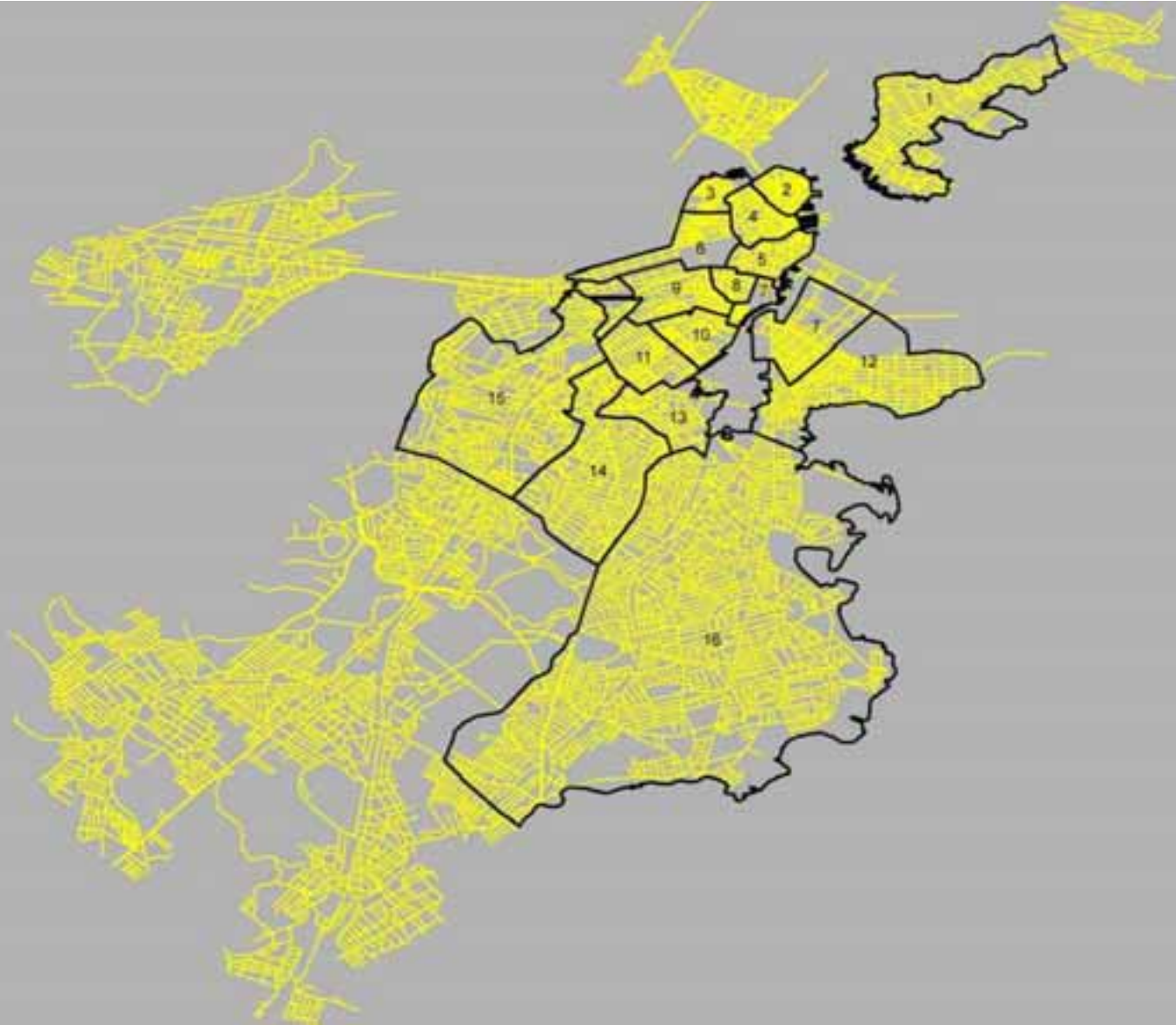
Boston Wards 1866



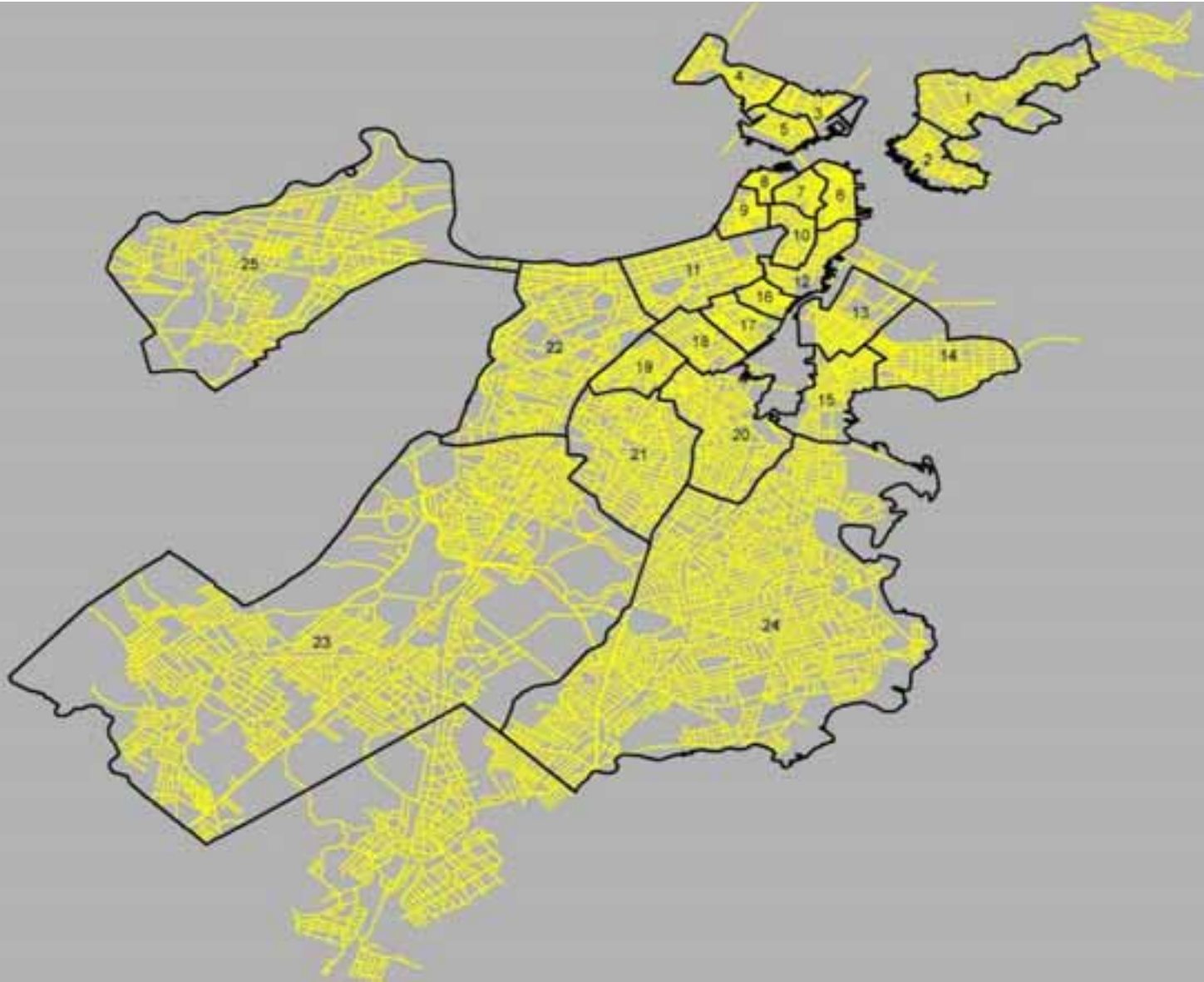
Boston Wards 1867



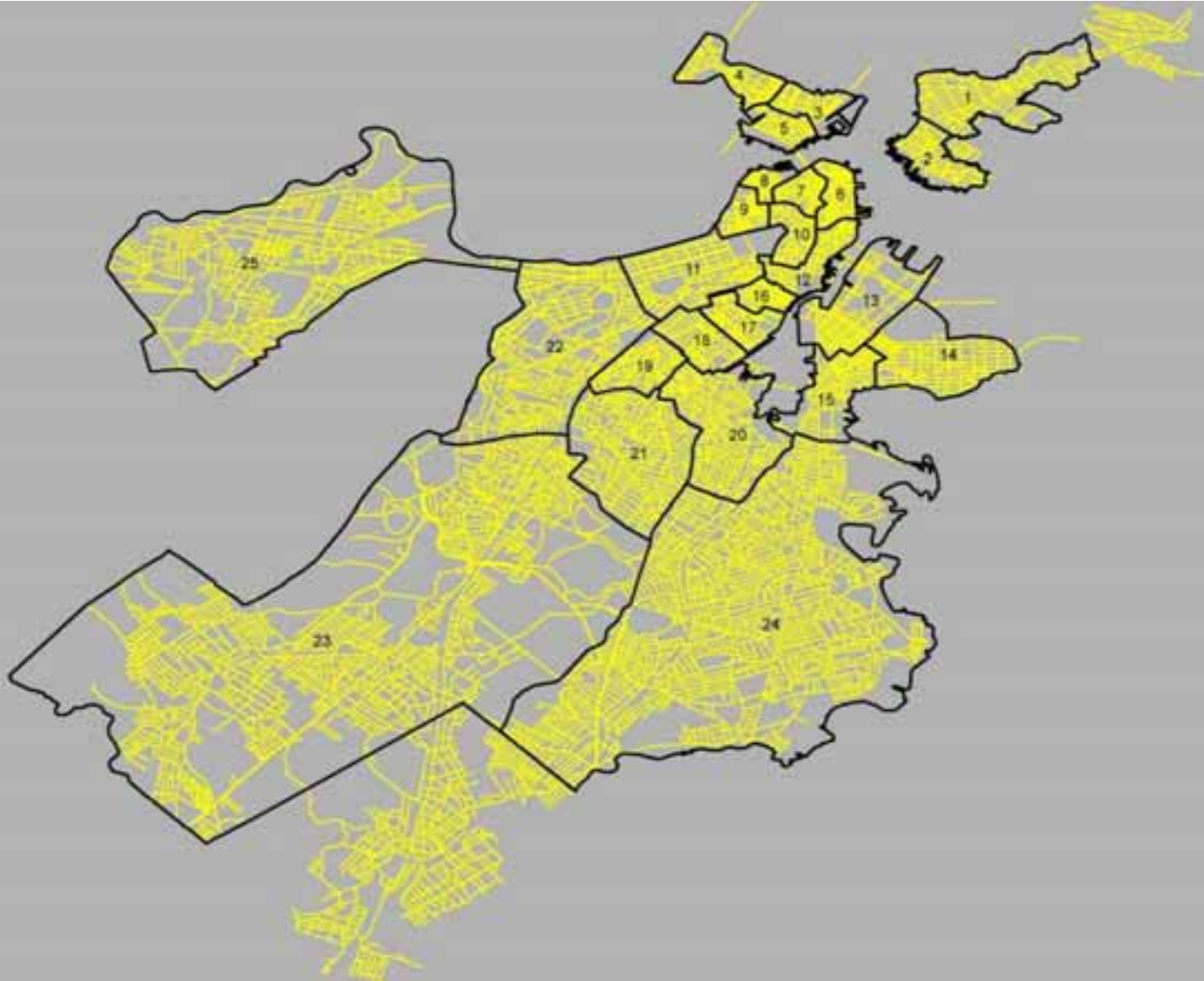
Boston Wards 1869



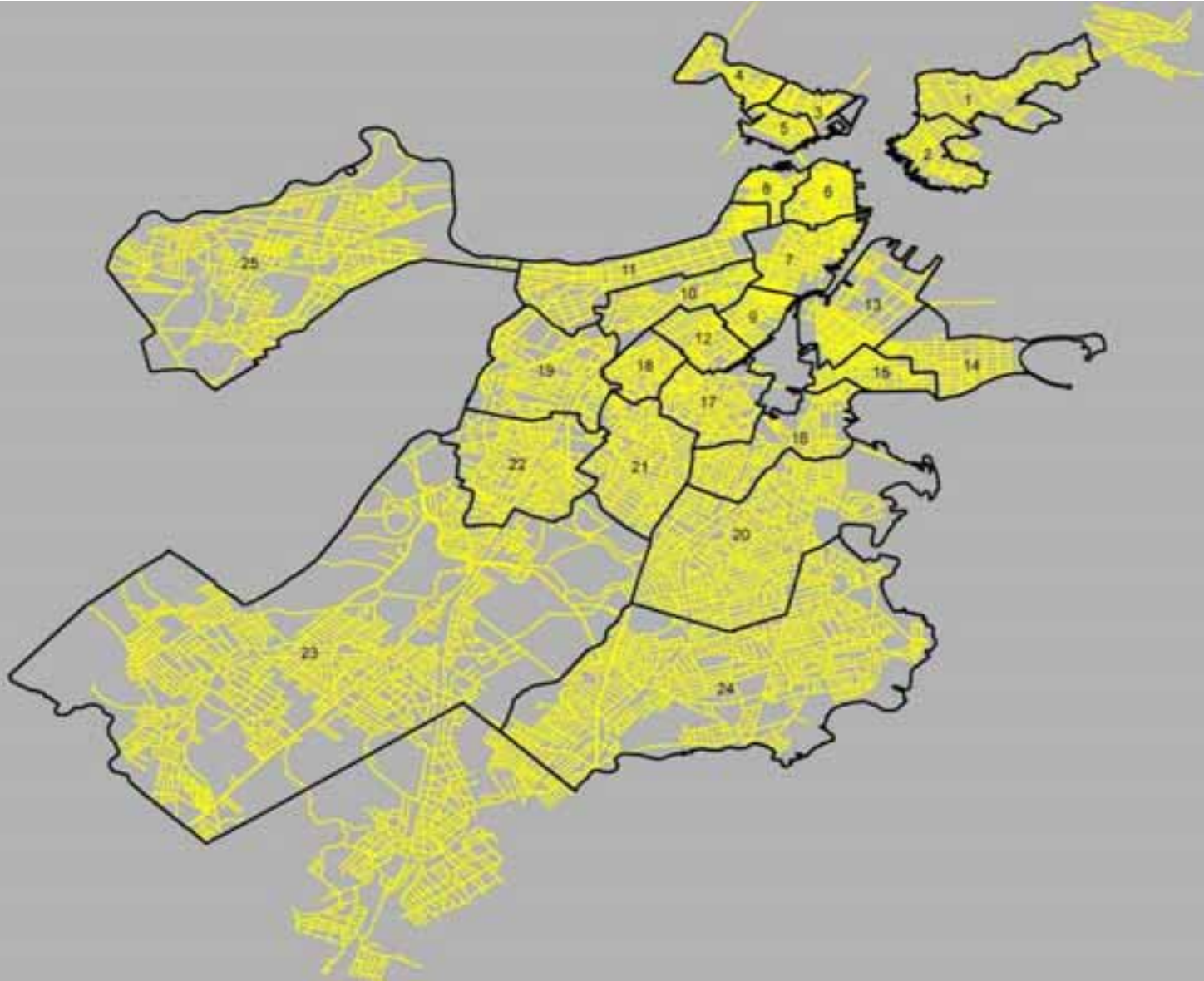
Boston Wards 1878



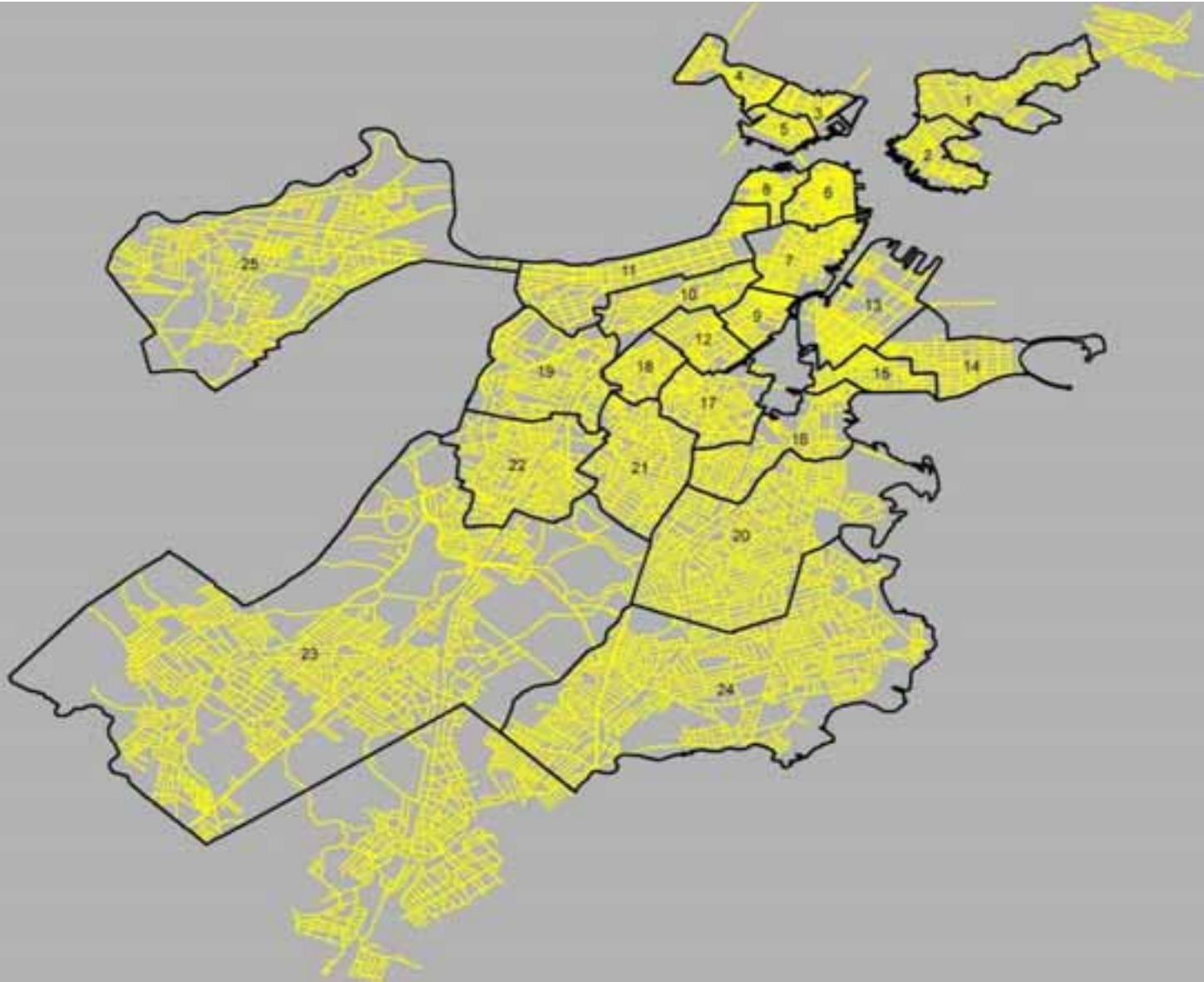
Boston Wards 1885



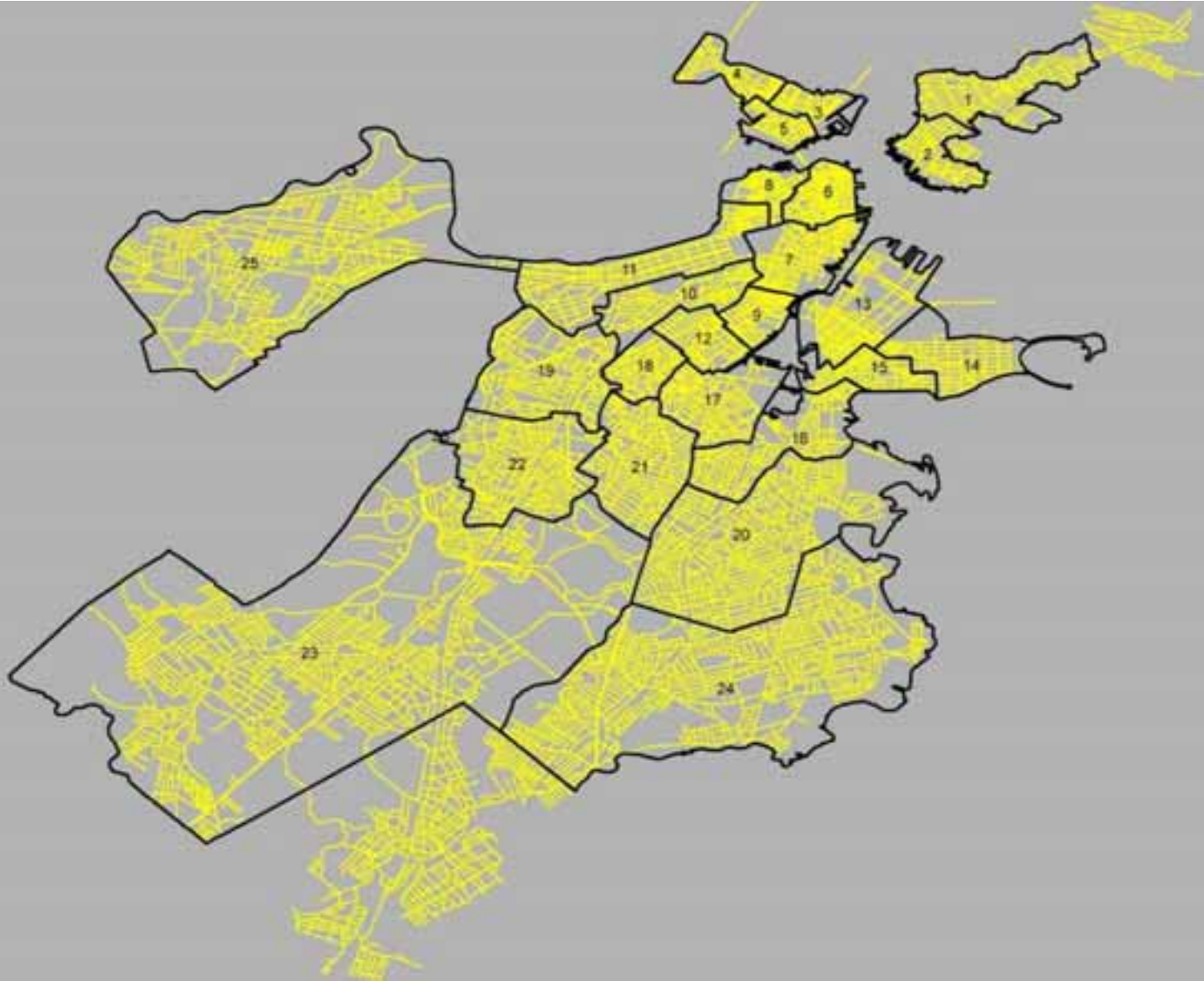
Boston Wards 1895



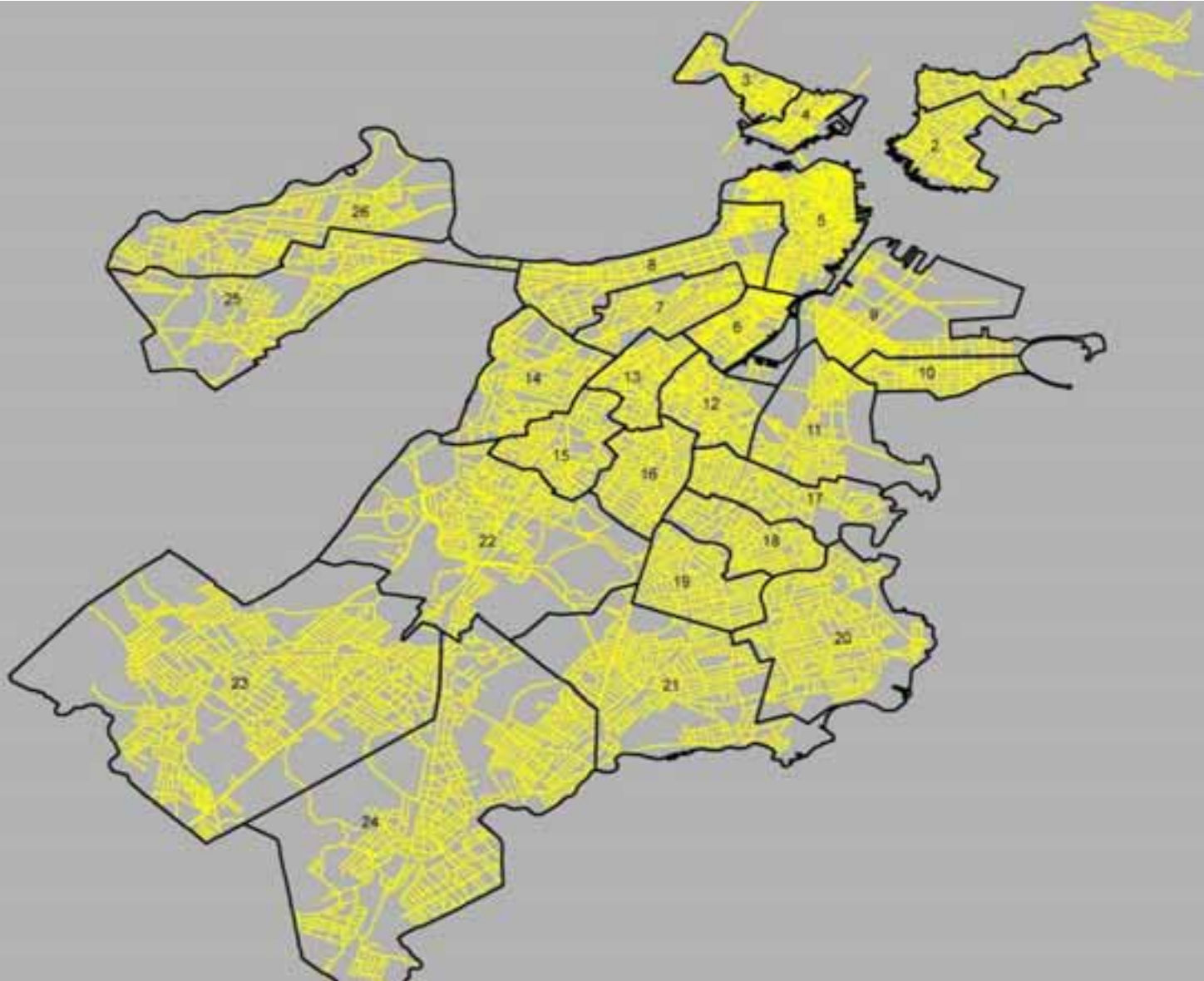
Boston Wards 1901



Boston Wards 1911



Boston Wards 1922-1930



Incorporating Census Data

New York City

- Ward Level Density in 1850 and 1860

Boston

- Ward Level Crude Mortality and Density in 1860

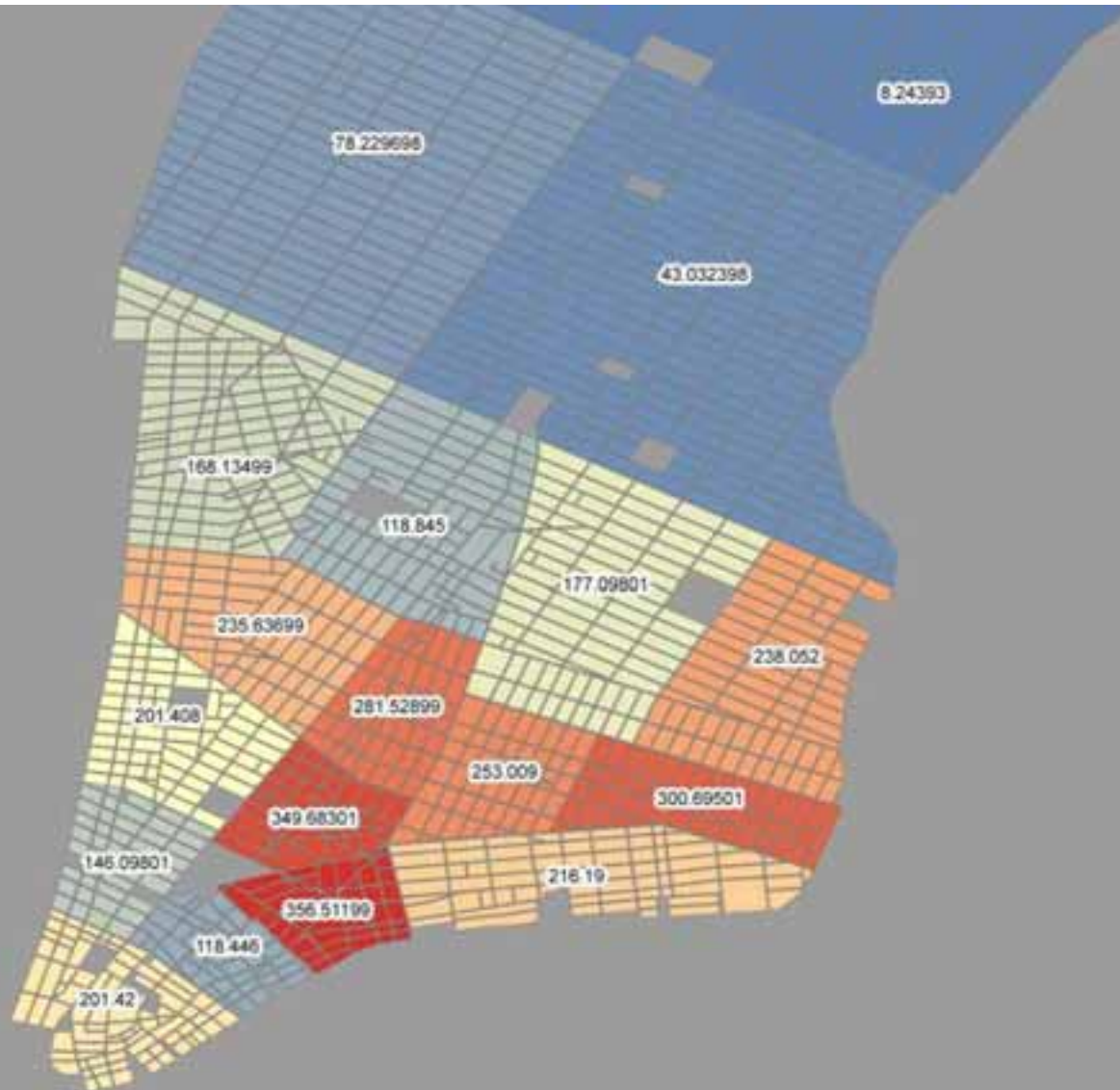
Baltimore

- Ward Level Child Mortality and Density in 1860
- Precinct Level Child Mortality in 1890

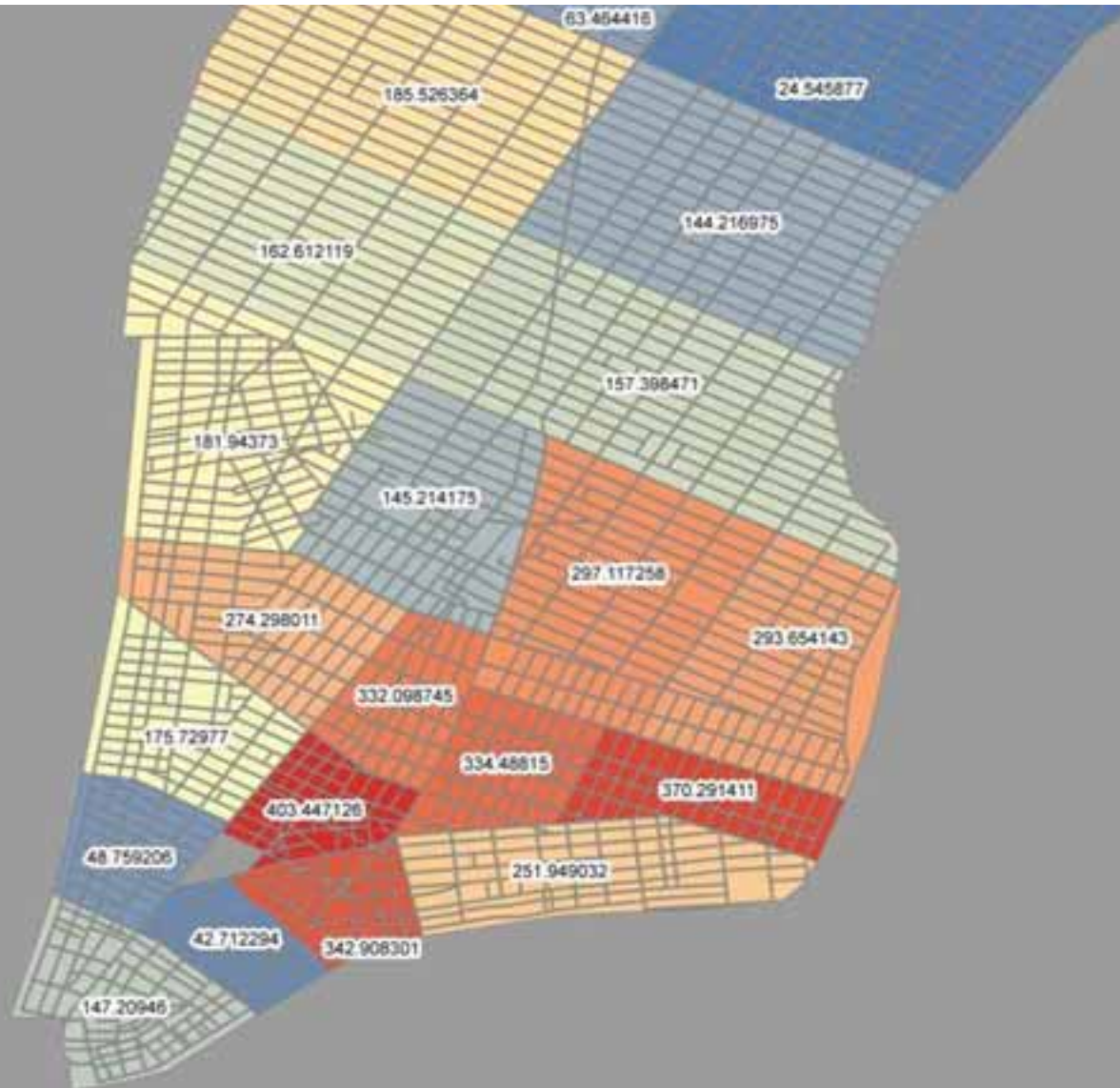
Chicago

- Enumeration District Level in 1880

New York City Population Density per Acre in 1850: Population Data from the Federal Census



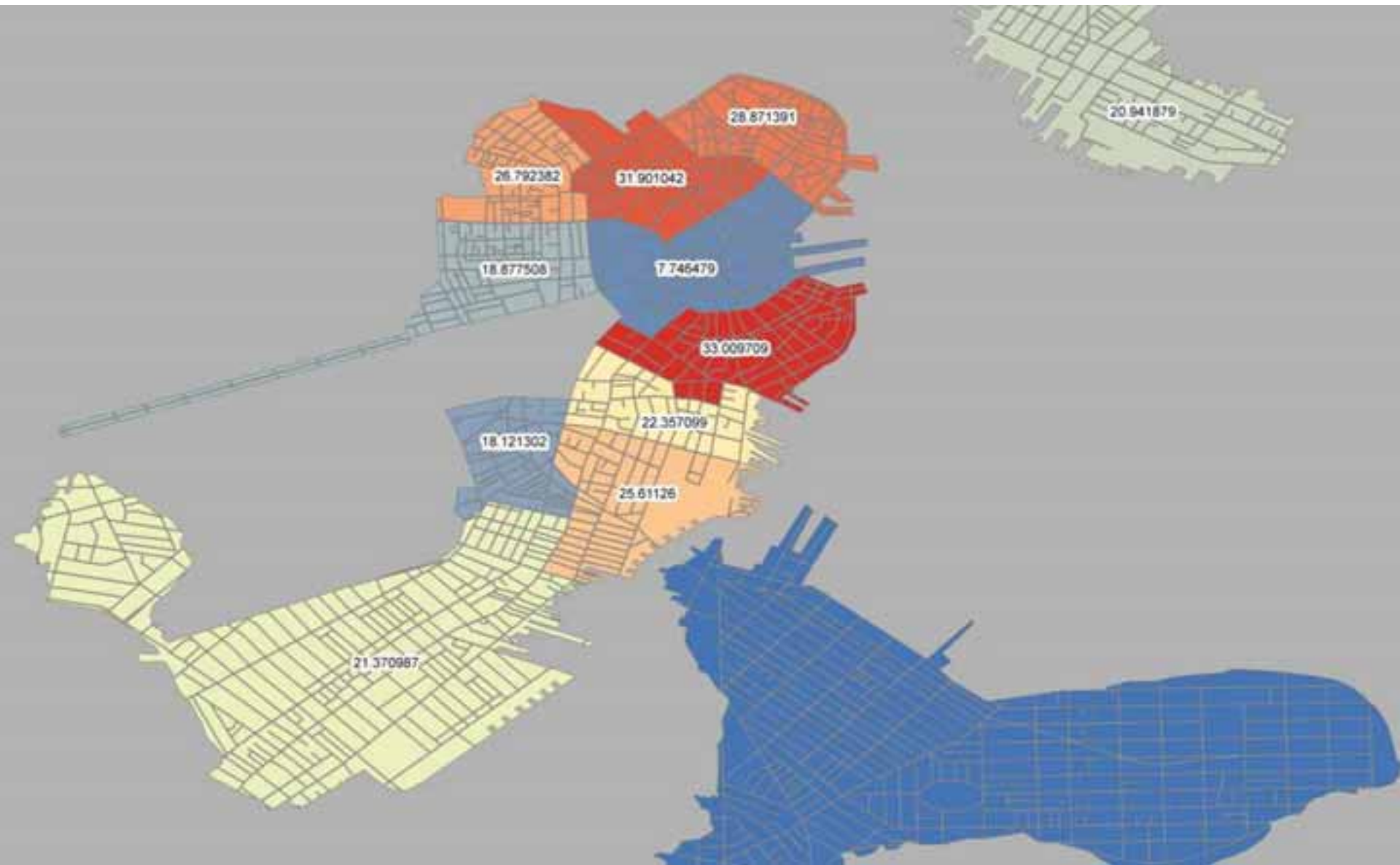
New York City Population Density per Acre in 1860: Population Data from the Federal Census



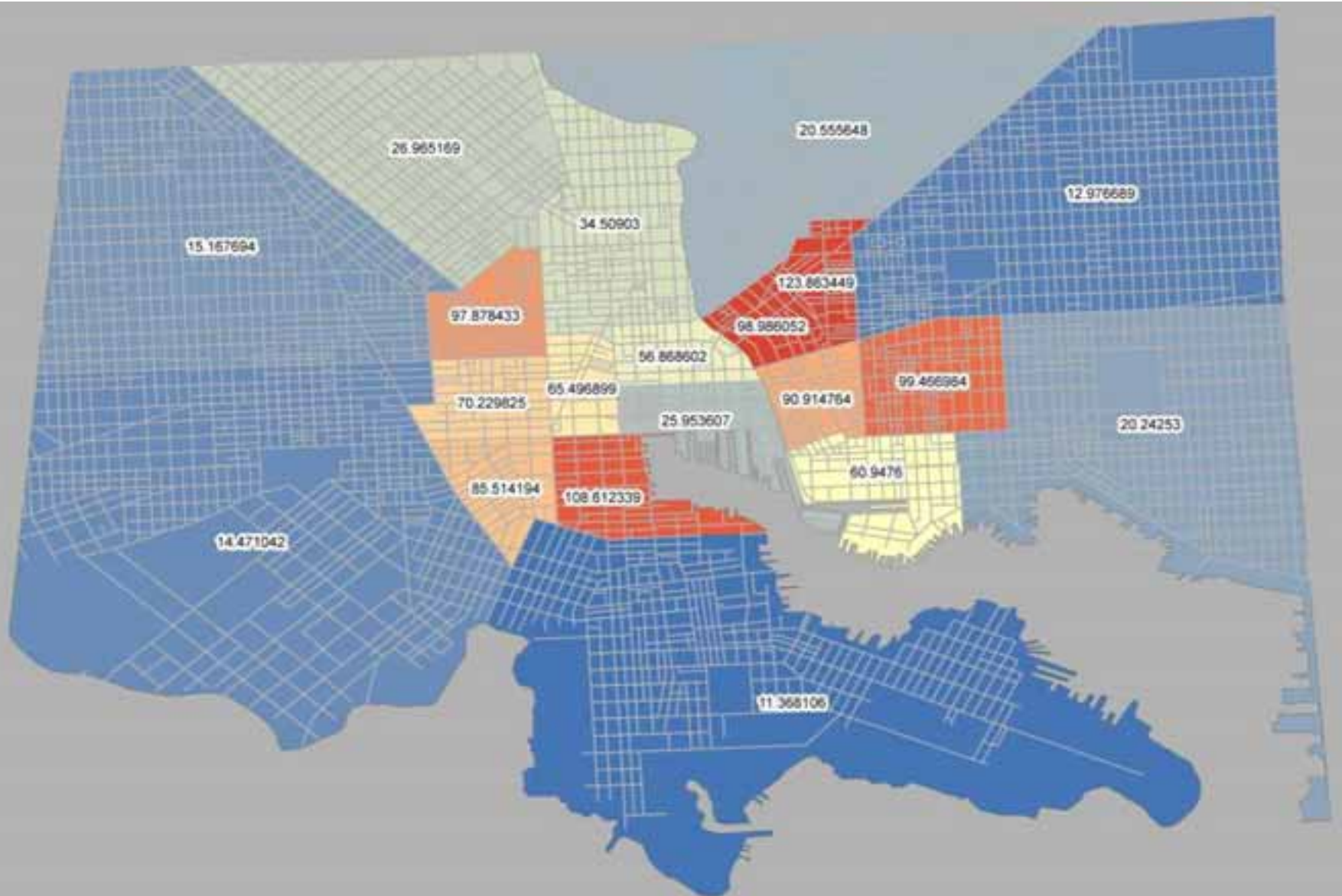
Boston Population Density per Acre 1860: Data from the Federal Census



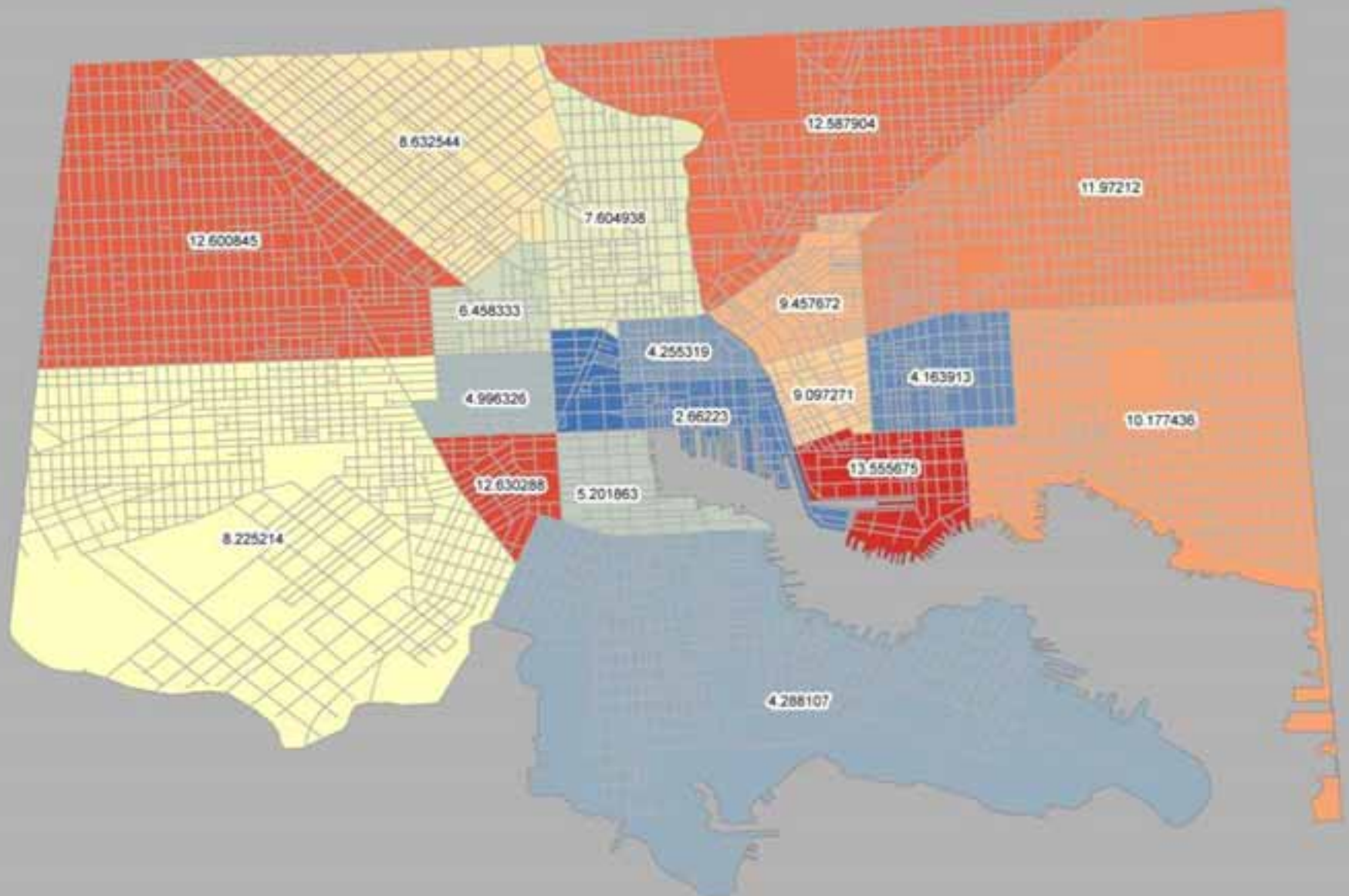
Boston Mortality Distribution 1860: Data from the Federal Mortality Census



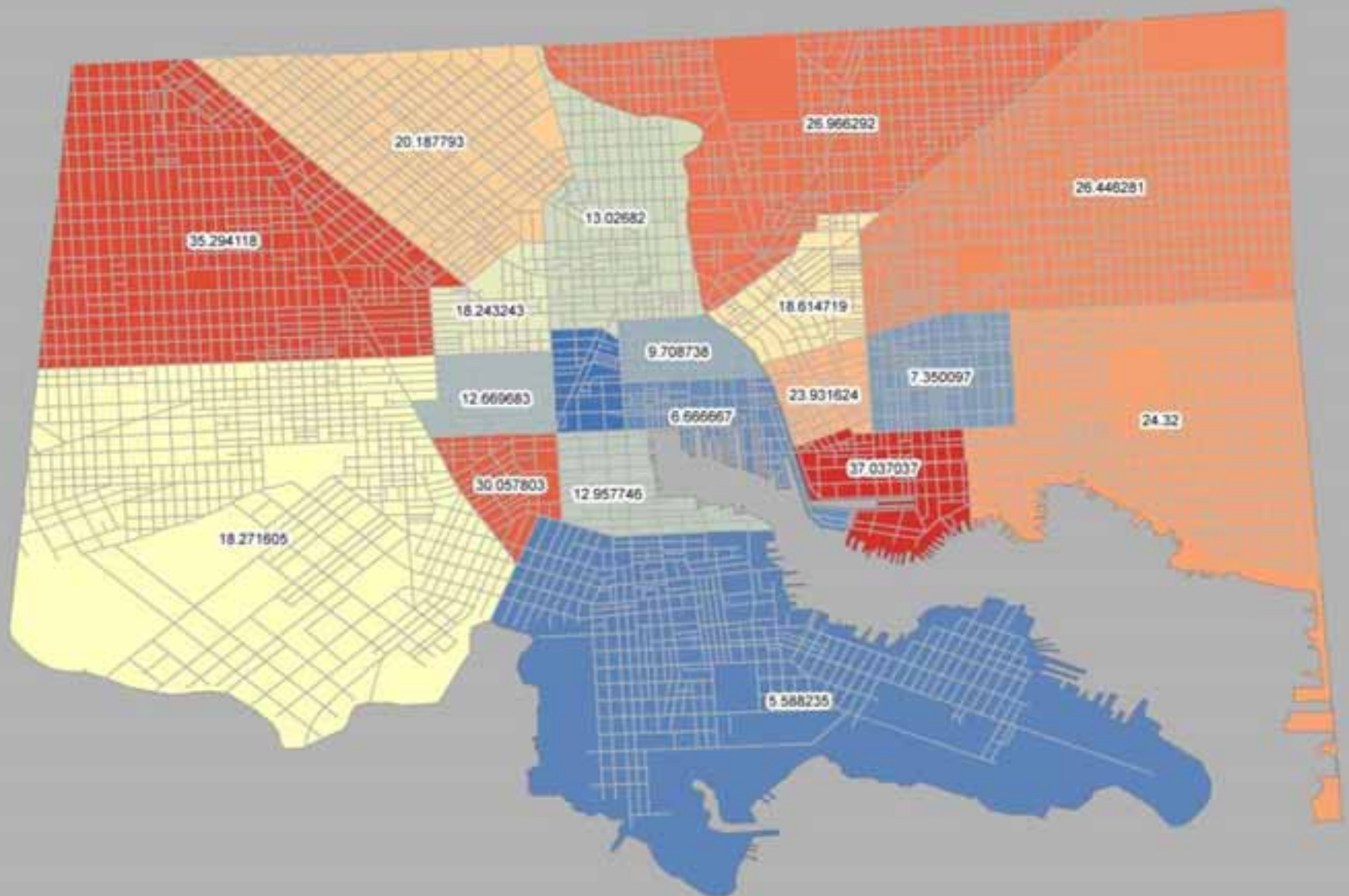
Baltimore Population Density per Acre in 1860: Population Data from the Federal Census



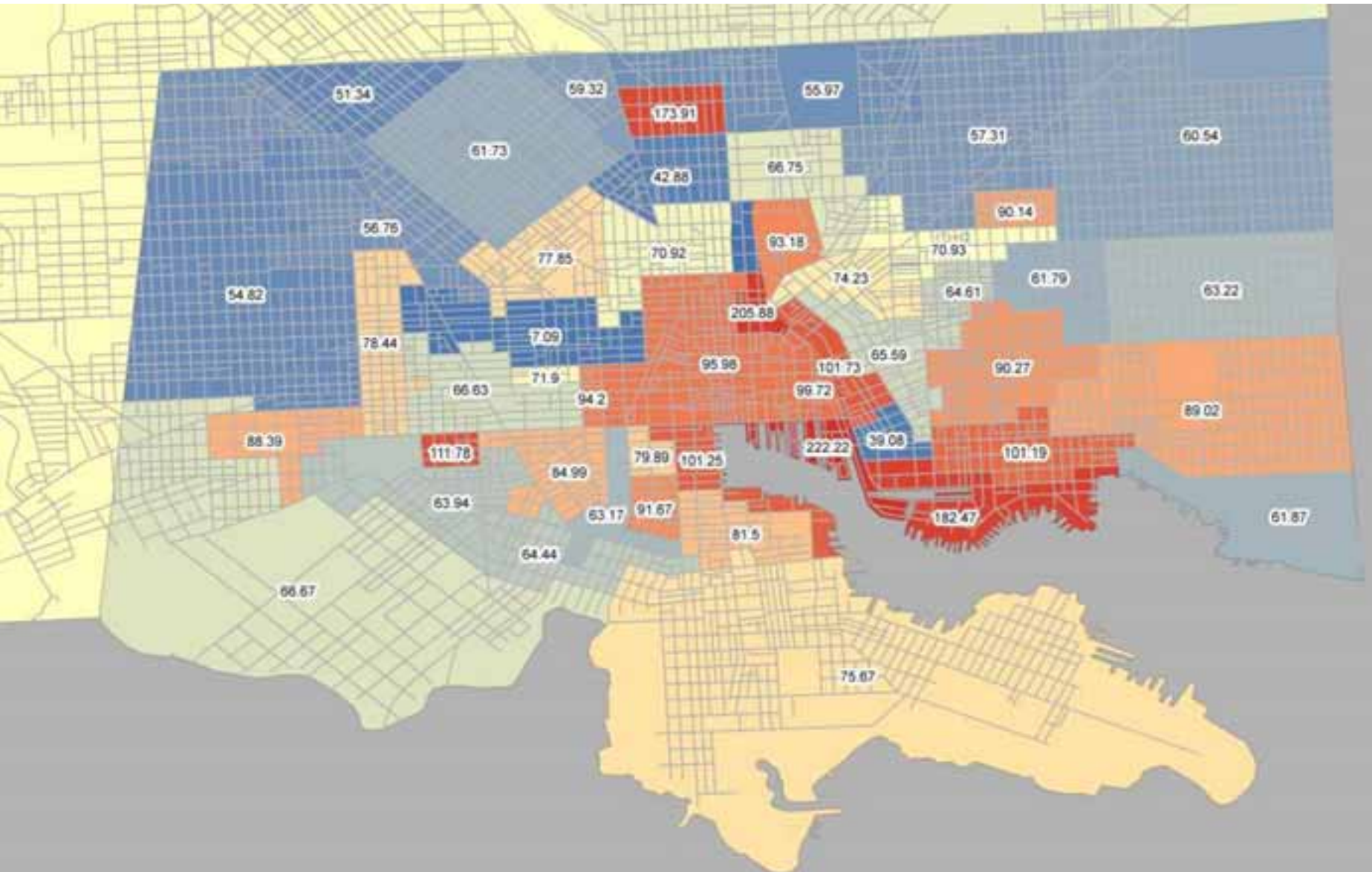
Baltimore Ward Crude Mortality Rate 1860: 1890 Federal Mortality Census



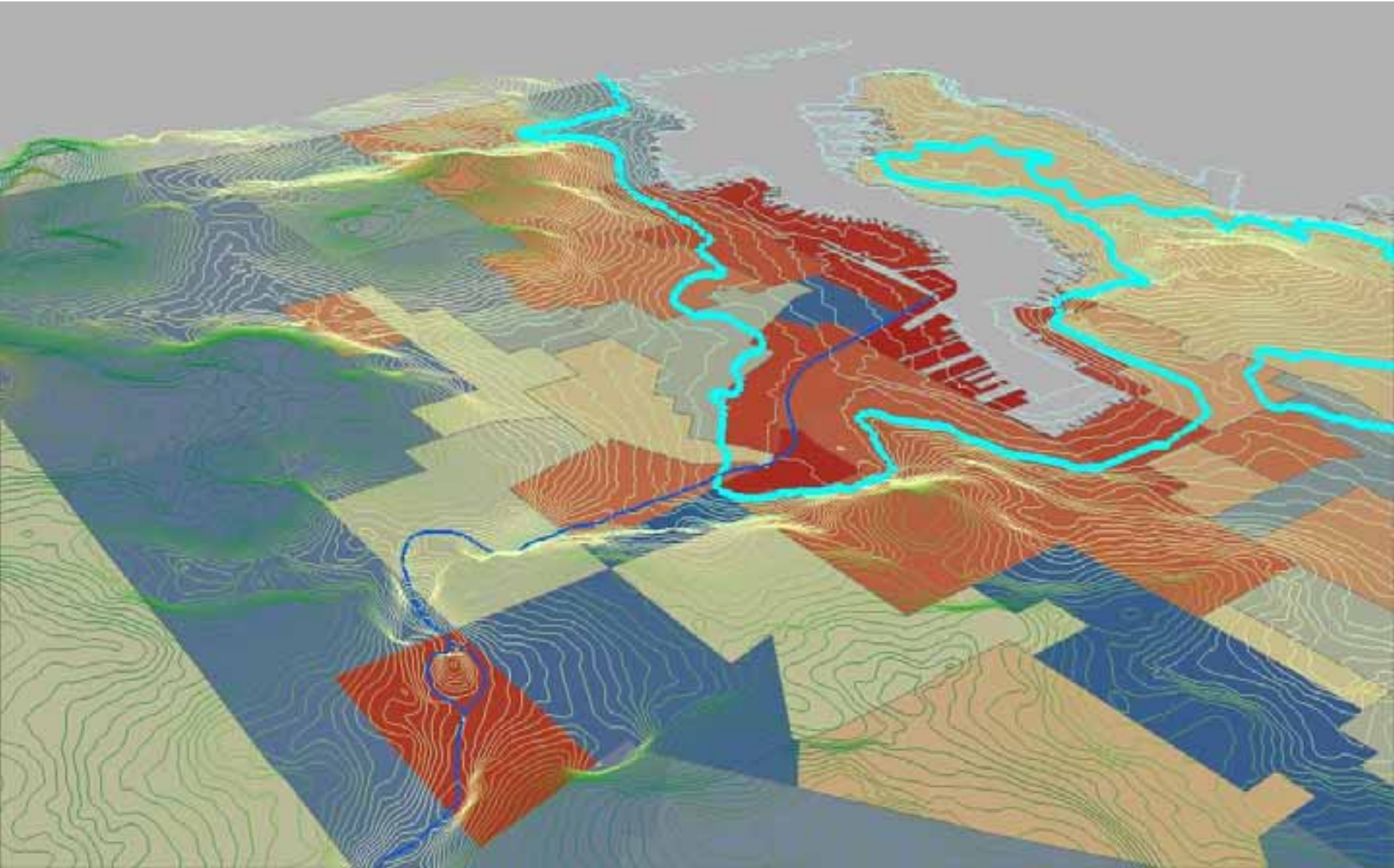
Baltimore Ward Child Mortality Rate 1860: 1890 Federal Mortality Census



Baltimore Precinct Child Mortality 1890: 1890 Federal Census – Statistics of Cities



Baltimore Precinct Child Mortality 1890: 1890 Federal Census – Statistics of Cities



Chicago Enumeration District Population Density 1880: Federal Population Census Data

Density Measured as
Population per Acre

Density Ranging From
1.53 people per Acre
(Blue)

To

191.83 people per Acre
(Red)



Incorporating Other Data Sources

Homer Hoyt (1933) Land Value Maps

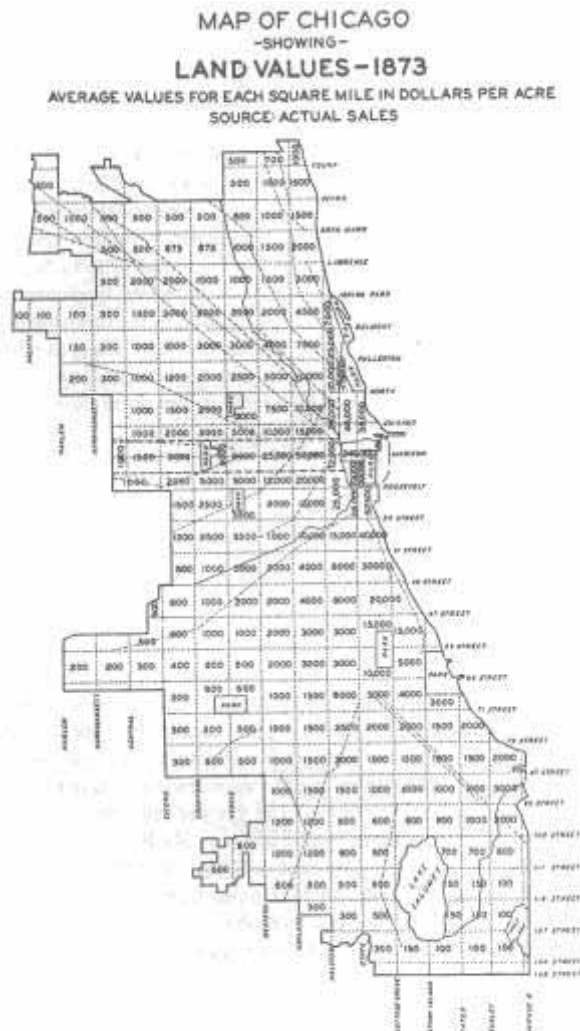


FIG. 21

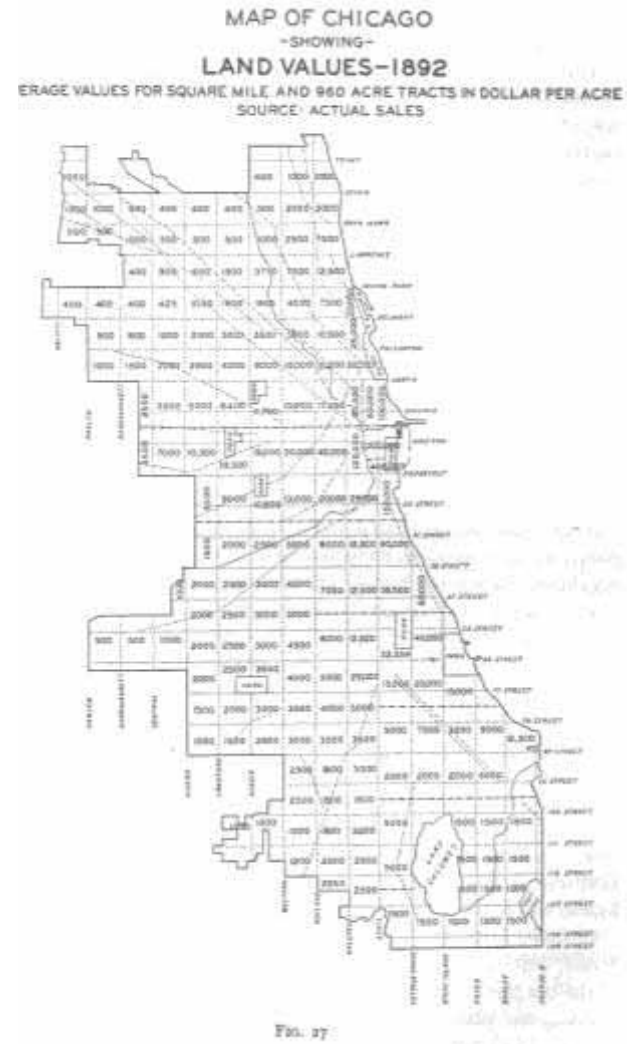
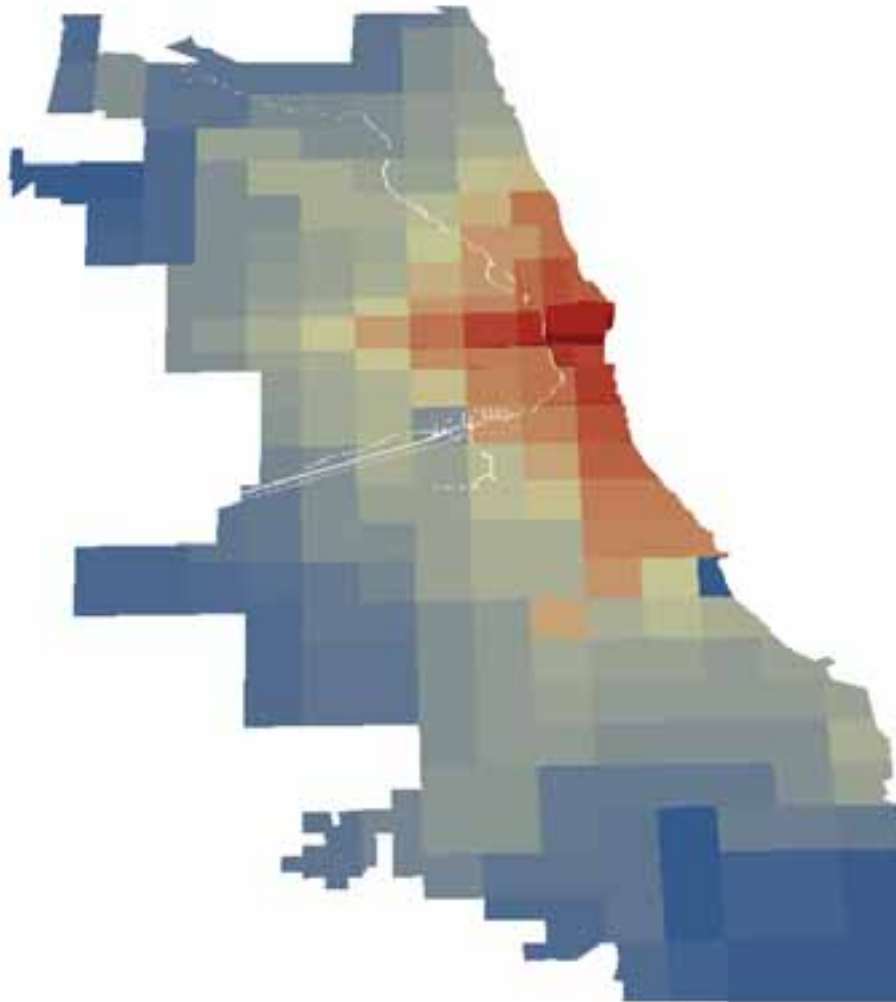


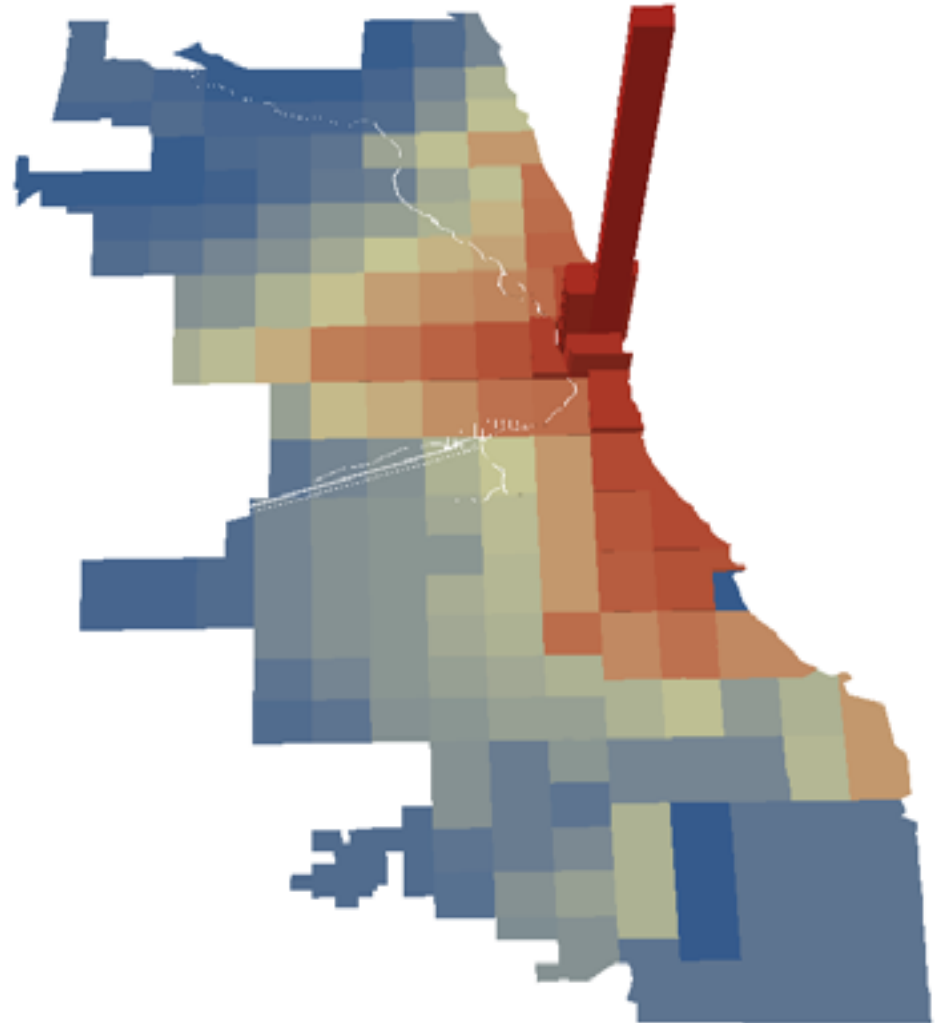
FIG. 27

Homer Hoyt's Land Values

1873



1892



Reconstructing Block-Level Data

Chicago Sewerage Installation History

Infrastructure Investment: Chicago Sewers Installed 1873-1899

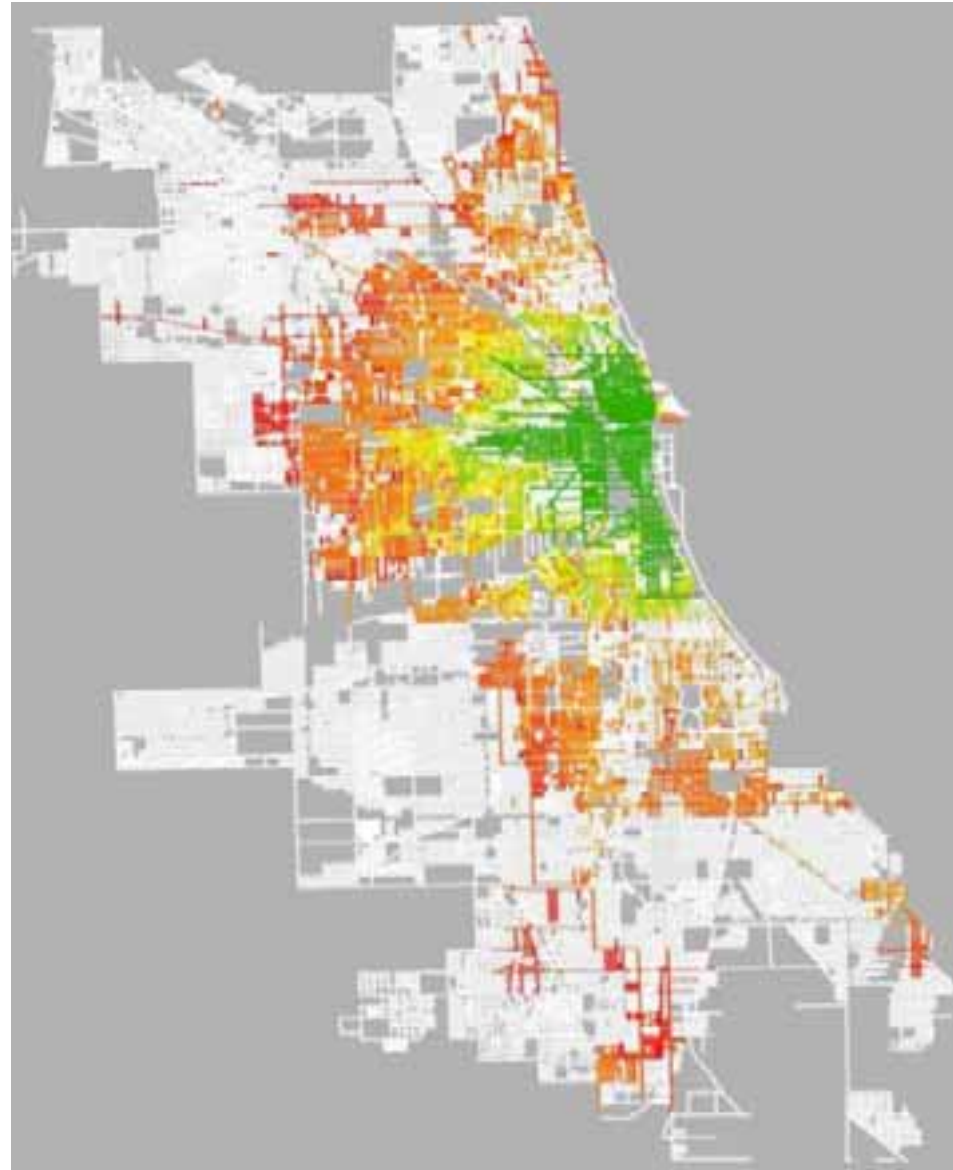
Investigating the capitalization of
Infrastructure investments into
local land values

Historical Chicago Sewerage Map

Dates range from 1873 (Green)
to 1899 (Red)

White lines indicate streets
without installed sewer pipes

Data from the Annual Reports of
the Department of Public Works



Reconstructing Address-Level Data

Residences of Union Army Veterans
1865-1930

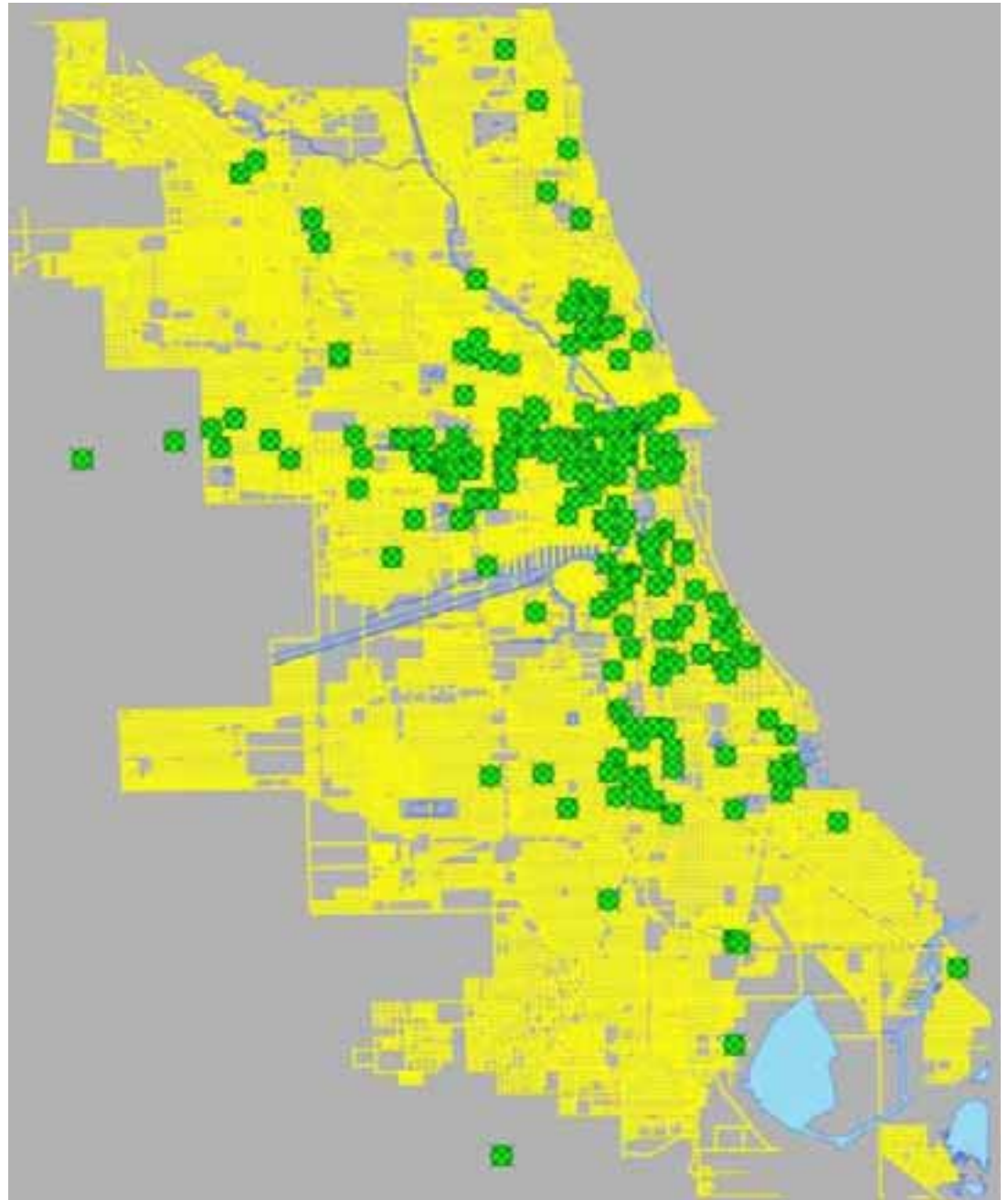
Chicago Civil War Veterans

Residential Information
- 1865 -1930

-Medical Records

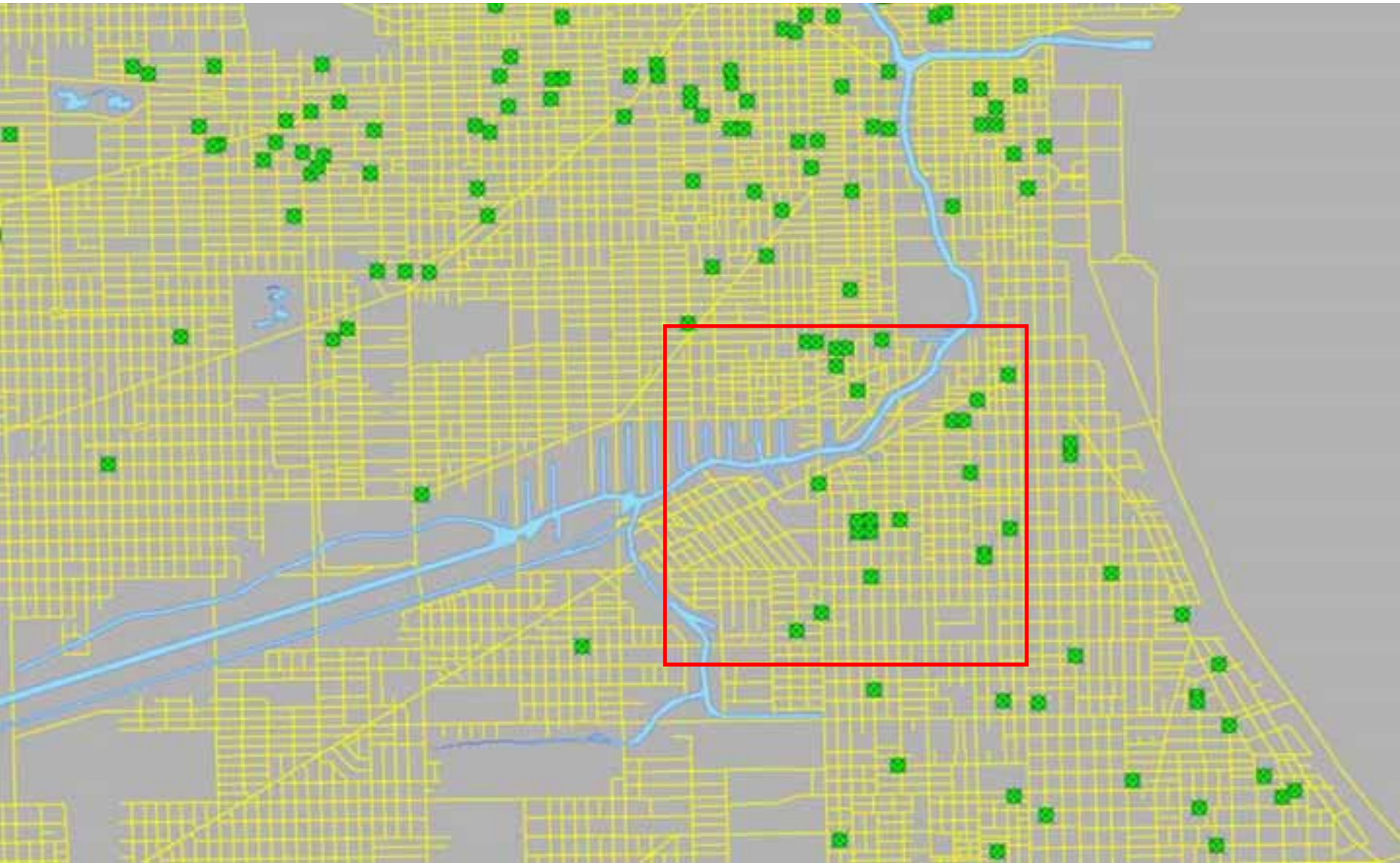
-Lifetime Economic Outcomes

- Linkable to Environmental
exposures across the
life-cycle



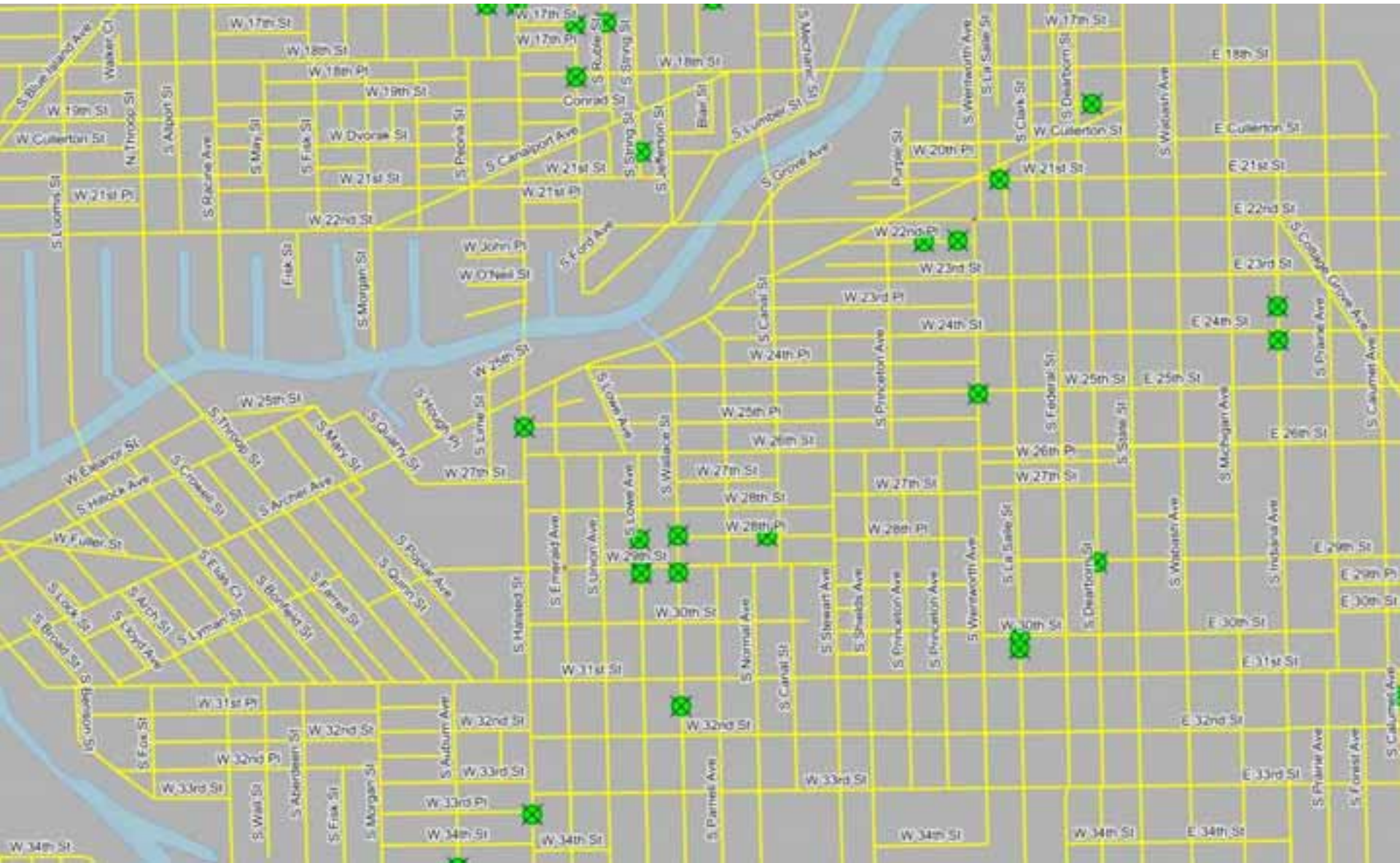
Union Army Residences

South and West Corridors of Chicago



Chicago:

A Closer Look at Bridgeport Residents



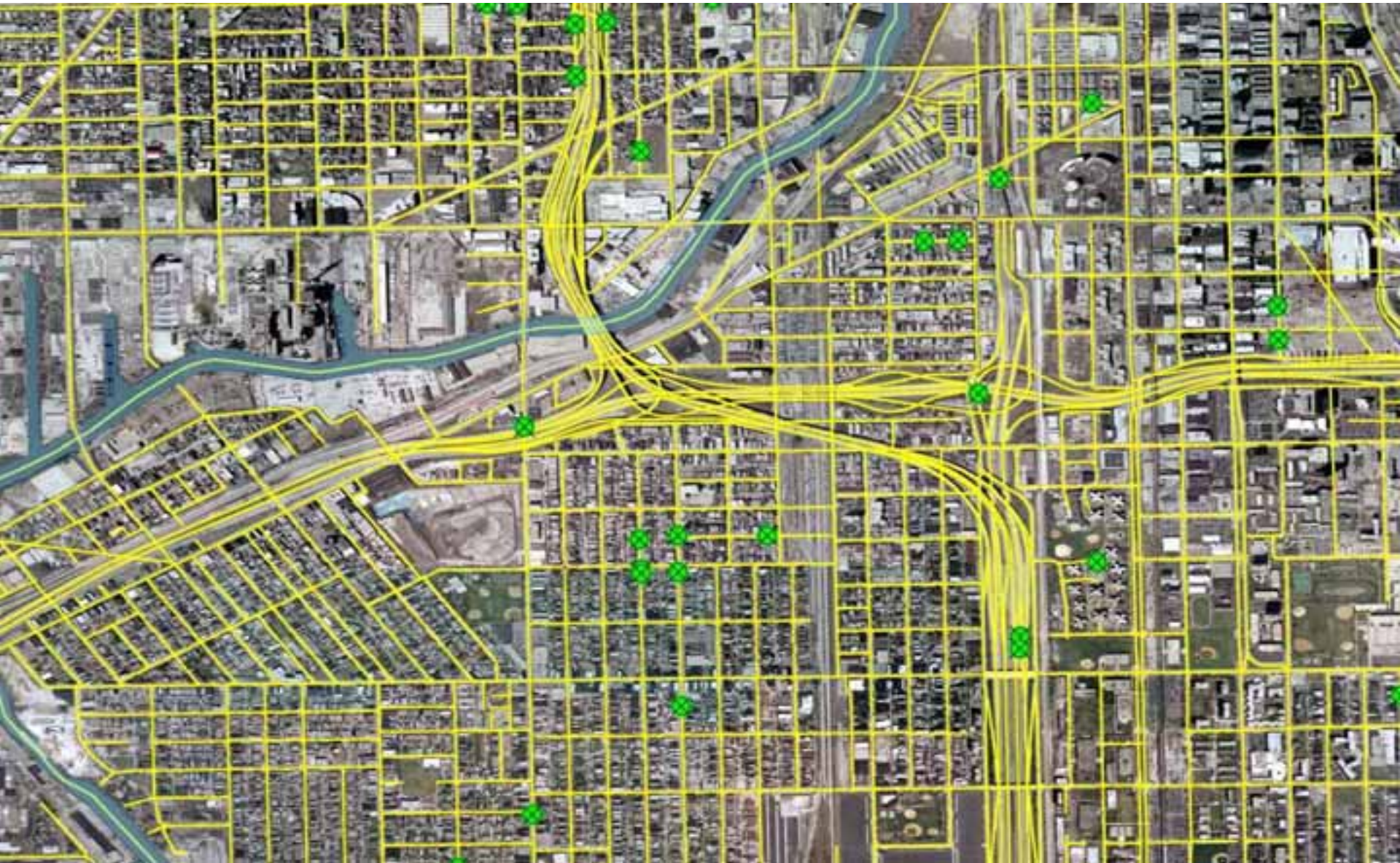
Chicago:

Bridgeport Residences with 1938 Aerial



Chicago Union Army Residents

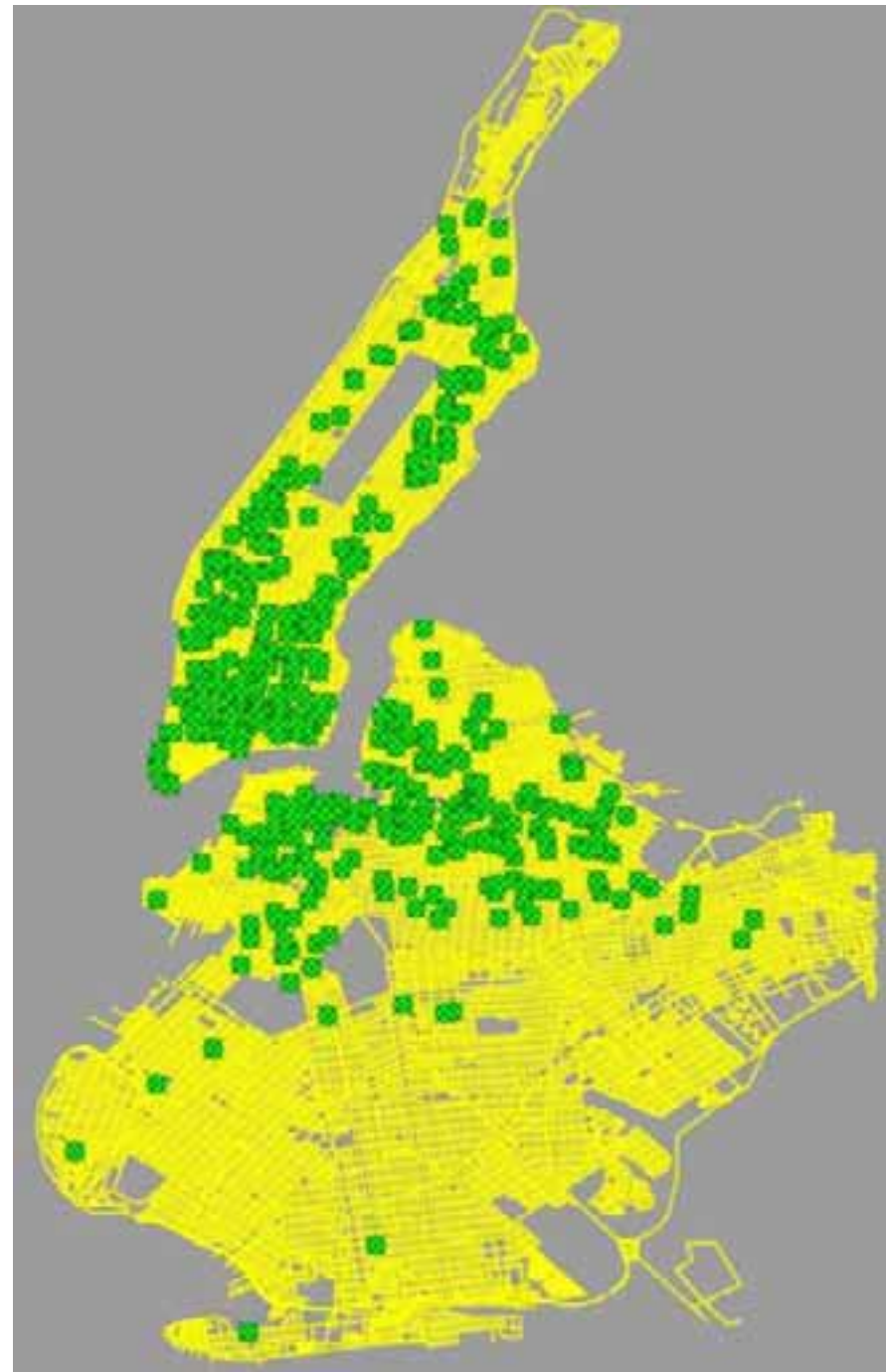
Note: 7 uncodable residences with contemporary data



New York City Union Army Veterans

New York City was the largest city in the United States throughout the study period

Our Address-level data allow a finer investigation into the influence of highly localized urban conditions on later life health and economic outcomes



New York City: Distribution of Residential Data



CPE Map Server Project

- Provides a chloropleth map viewer
- Provides data extracts
- Provides complete citations and notes

<http://www.cpe.uchicago.edu>

Thank You!!

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